

## Introduction

The latest routine international evaluation for conformation traits took place as scheduled at the Interbull Centre. Data from twenty five (26) countries were included in this evaluation.

International genetic evaluations for calving traits of bulls from Australia, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark-Finland-Sweden, Spain, France, United Kingdom, Hungary, Ireland, Italy, Japan, Korea, The Netherlands, Norway, New Zealand, Poland, South Africa, Estonia, Slovenia, Portugal, and United States of America were computed. Brown Swiss, Guernsey, Holstein, Jersey and Red Dairy Cattle breed data were included in this evaluation.

The WHFF trait definitions are available on this link [http://www.interbull.org/ib/conf\\_trait\\_hol\\_jer](http://www.interbull.org/ib/conf_trait_hol_jer)

The following is a list of substitute traits as applied by countries:

COU	BRD	TRT_Code	TRT_NAME	Subs_Trt
USA	BSW	ofr	overall frame	sta
USA	BSW	oru	overall rump	rwi
USA	BSW	rle	rump length	rwi
USA	BSW	thp	thurl position	rwi

Changes in national procedures

Changes in the national genetic evaluation of conformation traits are as follows:

CHE (BSW,HOL)	Drops in information due to manual edits
AUS (HOL,JER,RDC)	Decreasing in information due to pedigree changes, changes in status of bull which leads to a good number of bulls no longer being qualified.
JPN (HOL)	Some changes in proofs caused by additional records and in EDCs caused by modification of pedigree.
DEA (BSW)	Some daughters were excluded from the evaluation causing decrease in information.
USA (HOL)	Bulls with fewer daughters is the result of removal of incorrect daughters discovered through parentage verification.
NZL (BSW,GUE,HOL,JER,RDC)	Continuous DNA parentage testing affected daughter counts, herd count, EDCs, and reliabilities.
SVN (BSW,HOL,SIM)	Some bulls losing information (herds/daughters/EDC), due to changes in data base, related to the pedigree completeness as well as phenotypic data improvement.
ESP (HOL)	Change in base definition. Some Bulls lost some EDC, due to some daughters that were assigned as culled but did contribute more information now.
ITA (BSW)	For some traits, new information cause low correlation with previous evaluation for some years.
FRA (HOL)	The reliability from the singlestep is now used as a factor of the publication. For conformation traits, before it was the reliability of the trait usu (udder support) which was used as reference. Now it is the loc (locomotion) trait which is used. Due to this change bulls do loose points in reliability.

## INTERBULL CHANGES COMPARED TO THE PREVIOUS ROUTINE RUN

### Post-processing Windows:

According to the decision taken by ITC in Orlando (2015) to review the post-processing windows every 5 years, during the 2020 the relative working group has been re-activated and new windows have been identified.

As before, the upper bounds have been set to 0.99 as these were judged to have very little effect on evaluations while the lower values have been reduced to the 10th percentile. This reduction would provide post-processed correlations to be closer to the real estimated ones. Over the past five years, in fact, the previous adopted lower value (25th percentile) had been found too high causing estimated and post-processed correlations to differ significantly from each other. The new lower values have been applied to all breeds and traits.

The weight assigned to the magnitude of the changes tested by each country has also been revised. The new weight will allow post-processed correlations to take more in consideration the value of the new estimated ones even when no changes are applied by the countries.

The new weights are as follows:

No changes :: 2  
Small changes:: 1  
Big changes :: 0

More information can be read on [https://interbull.org/ib/rg\\_procedure](https://interbull.org/ib/rg_procedure)

#### DATA AND METHOD OF ANALYSIS

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Data were national genetic evaluations of AI sampled bulls with at least 10 daughters or 10 EDC (for clinical mastitis and maternal calving traits at least 50 daughters or 50 EDC, and for direct calving traits at least 50 calvings or 50 EDC) in at least 10 herds. Table 1 presents the amount of data included in this Interbull evaluation for all breeds.

National proofs were first de-regressed within country and then analysed jointly with a linear model including the effects of evaluation country, genetic group of bull and bull merit. Heritability estimates used in both the de-regression and international evaluation were as in each country's national evaluation.

Table 2 presents the date of evaluation as supplied by each country

Estimated genetic parameters and sire standard deviations are shown in APPENDIX I and the corresponding number of common bulls are listed in APPENDIX II.

#### SCIENTIFIC LITERATURE

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The international genetic evaluation procedure is based on international work described in the following scientific publications:

International genetic evaluation computation:  
Schaeffer. 1994. J. Dairy Sci. 77:2671-2678  
Klei, 1998. Interbull Bulletin 17:3-7

Verification and Genetic trend validation:  
Klei et al., 2002. Interbull Bulletin 29:178-182.  
Boichard et al., 1995. J. Dairy Sci. 78:431-437

Weighting factors:  
Fikse and Banos, 2001. J. Dairy Sci. 84:1759-1767

De-regression:  
Sigurdsson and G. Banos. 1995. Acta Agric. Scand. 45:207-219  
Jairath et al. 1998. J. Dairy Sci. Vol. 81:550-562

Genetic parameter estimation:  
Klei and Weigel, 1998, Interbull Bulletin 17:8-14  
Sullivan, 1999. Interbull Bulletin 22:146-148

Post-processing of estimated genetic correlations:  
Mark et al., 2003, Interbull Bulletin 30:126-135  
Jorjani et al., 2003. J. Dairy Sci. 86:677-679  
<https://wiki.interbull.org/public/rG%20procedure?action=print>

Time edits  
Weigel and Banos. 1997. J. Dairy Sci. 80:3425-3430

International reliability estimation  
Harris and Johnson. 1998. Interbull Bulletin 17:31-36

#### NEXT ROUTINE INTERNATIONAL EVALUATION

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Dates for the next routine evaluation can be found on  
<http://www.interbull.org/ib/servicecalendar>.

#### NEXT TEST INTERNATIONAL EVALUATION

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Dates for the next test run can be found on

<http://www.interbull.org/ib/servicecalendar>.

PUBLICATION OF INTERBULL ROUTINE RUN

Results were distributed by the Interbull Centre to designated representatives in each country. The international evaluation file comprised international proofs expressed on the base and unit of each country included in the analysis. Such records readily provide more information on bull performance in various countries, thereby minimizing the need to resort to conversions.

At the same time, all recipients of Interbull results are expected to honor the agreed code of practice, decided by the Interbull Steering Committee, and only publish international evaluations on their own country scale. Evaluations expressed on another country scale are confidential and may only be used internally for research and review purposes.

PUBLICATION OF INTERBULL TEST RUN

Test evaluation results are meant for review purposes only and should not be published.

Table 1. National evaluation data considered in the Interbull evaluation for conformation traits (August Routine Evaluation 2022). Number of records for stature by breed

Country	BSW	GUE	HOL	JER	RDC	SIM
AUS		45	3881	752	244	
BEL			1660			
CAN	241	101	12352	804	889	
CHE	2865		3014	48		
CZE			4307			
DEA	3695					
DEU			21046		264	
DFS			12231	2073	6404	
ESP			4254			
EST			829			
FRA	390		17859			
FRM						
GBR	23	224	6318	456	332	
HUN			2818			
IRL			1829			
ISR						
ITA	2203		8641	101		
JPN			6071			
KOR			1485			
LTU						
LVA			1258		607	
NLD	132		15226	47	56	
NOR					2463	
NZL			6673	4080	586	
POL			9100			
PRT			2125			
SVK						
SVN	334		628			
URY						
USA	907	714	33634	4417	267	
ZAF			852	552		
HRV						
CAM					36	
No. Records	10790	1084	178091	13330	12148	
Pub. Proofs	8633	923	134511	11579	12800	0

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal

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BSW      sta

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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.38								
CHE	0.95	12.43							
FRA	0.98	0.96	0.91						
ITA	0.96	0.95	0.95	14.00					
NLD	0.95	0.95	0.96	0.92	4.11				
USA	0.98	0.95	0.97	0.95	0.94	1.63			
DEA	0.96	0.98	0.97	0.96	0.95	0.96	11.30		
SVN	0.92	0.90	0.90	0.93	0.91	0.90	0.92	15.70	
GBR	0.96	0.92	0.95	0.93	0.93	0.95	0.89	0.90	0.85

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BSW      cwi

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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.16								
CHE	0.90	10.26							
FRA	0.87	0.90	0.92						
ITA	0.81	0.85	0.87	21.41					
NLD	0.91	0.82	0.87	0.71	4.58				
USA	0.89	0.90	0.92	0.86	0.82	0.91			
DEA	0.87	0.82	0.83	0.75	0.81	0.80	11.41		
SVN	0.88	0.88	0.87	0.85	0.81	0.87	0.90	22.26	
GBR	0.91	0.84	0.82	0.71	0.90	0.80	0.81	0.81	1.44

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BSW      bde

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	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	6.70								
CHE	0.84	10.35							
FRA	0.72	0.87	0.91						
ITA	0.78	0.91	0.91	17.89					
NLD	0.82	0.84	0.86	0.85	4.30				
DEA	0.80	0.90	0.92	0.89	0.81	11.18			
SVN	0.78	0.74	0.80	0.83	0.79	0.73	25.60		
GBR	0.86	0.89	0.81	0.84	0.90	0.87	0.85	1.63	
USA	0.72	0.75	0.86	0.78	0.86	0.80	0.78	0.86	0.84

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BSW      ang

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	CAN	CHE	FRA	NLD	USA	GBR
CAN	8.13					
CHE	0.69	11.02				
FRA	0.87	0.67	0.86			
NLD	0.80	0.68	0.69	3.72		
USA	0.86	0.67	0.77	0.77	1.09	
GBR	0.89	0.77	0.80	0.82	0.90	0.76

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BSW      ran

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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.83								
CHE	0.93	10.68							
FRA	0.97	0.96	0.94						
ITA	0.94	0.93	0.94	23.02					
NLD	0.95	0.92	0.96	0.92	4.54				
USA	0.97	0.94	0.97	0.91	0.95	1.37			
DEA	0.96	0.94	0.95	0.95	0.92	0.97	11.84		
SVN	0.91	0.89	0.90	0.89	0.90	0.90	0.90	21.98	

GBR 0.96 0.94 0.97 0.94 0.96 0.96 0.91 0.92 2.05

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BSW rwi  
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	CAN	CHE	FRA	NLD	USA	DEA	GBR	SVN	ITA
CAN	6.97								
CHE	0.89	10.26							
FRA	0.96	0.86	0.98						
NLD	0.93	0.85	0.93	4.03					
USA	0.91	0.84	0.87	0.80	0.97				
DEA	0.92	0.89	0.92	0.79	0.90	13.33			
GBR	0.93	0.85	0.92	0.88	0.93	0.83	1.36		
SVN	0.90	0.80	0.94	0.86	0.83	0.90	0.86	26.49	
ITA	0.88	0.79	0.90	0.79	0.86	0.87	0.88	0.89	19.37

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BSW rls  
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.71								
CHE	0.92	13.07							
FRA	0.91	0.92	1.02						
ITA	0.91	0.86	0.93	23.67					
NLD	0.88	0.84	0.88	0.85	5.07				
USA	0.95	0.93	0.90	0.87	0.86	0.82			
DEA	0.92	0.91	0.92	0.89	0.82	0.91	12.23		
SVN	0.86	0.82	0.89	0.85	0.83	0.86	0.89	21.68	
GBR	0.85	0.86	0.90	0.83	0.86	0.83	0.87	0.82	1.44

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BSW fan  
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.99								
CHE	0.67	14.01							
FRA	0.79	0.72	1.12						
ITA	0.69	0.85	0.80	21.57					
NLD	0.74	0.68	0.84	0.70	5.01				
USA	0.82	0.72	0.84	0.85	0.81	0.86			
DEA	0.62	0.91	0.66	0.89	0.63	0.65	11.57		
SVN	0.68	0.84	0.70	0.85	0.66	0.70	0.94	24.66	
GBR	0.81	0.72	0.90	0.74	0.88	0.83	0.68	0.72	1.29

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BSW hde  
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	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	8.30							
CHE	0.87	12.68						
FRA	0.83	0.81	1.19					
ITA	0.80	0.84	0.85	21.41				
NLD	0.77	0.74	0.83	0.74	5.01			
DEA	0.79	0.87	0.85	0.93	0.76	12.14		
SVN	0.77	0.76	0.85	0.89	0.73	0.91	30.10	
USA	0.85	0.73	0.85	0.89	0.81	0.78	0.82	0.86

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BSW fua  
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	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.77								
CHE	0.87	12.11							
FRA	0.89	0.87	0.89						
ITA	0.88	0.84	0.85	19.97					
NLD	0.90	0.85	0.90	0.84	4.64				
USA	0.94	0.86	0.86	0.93	0.87	1.31			
DEA	0.83	0.85	0.93	0.83	0.81	0.83	11.13		
SVN	0.74	0.75	0.83	0.83	0.76	0.74	0.90	20.78	

GBR 0.92 0.84 0.88 0.88 0.91 0.91 0.76 0.61 1.32

BSW ruh

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.62								
CHE	0.91	11.99							
FRA	0.85	0.83	0.92						
ITA	0.75	0.84	0.86	12.95					
NLD	0.77	0.84	0.87	0.86	4.29				
USA	0.83	0.83	0.87	0.87	0.87	1.08			
DEA	0.82	0.86	0.90	0.93	0.88	0.85	11.75		
SVN	0.81	0.84	0.80	0.87	0.89	0.83	0.89	18.92	
GBR	0.74	0.80	0.86	0.83	0.87	0.91	0.76	0.76	1.73

BSW ruw

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	8.10							
CHE	0.91	12.00						
FRA	0.85	0.86	0.86					
ITA	0.78	0.88	0.79	13.33				
NLD	0.69	0.66	0.80	0.69	4.29			
USA	0.86	0.89	0.85	0.89	0.79	1.03		
DEA	0.85	0.91	0.76	0.95	0.55	0.90	12.23	
SVN	0.82	0.83	0.76	0.86	0.70	0.82	0.84	17.62

BSW usu

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.44								
CHE	0.90	12.03							
FRA	0.83	0.91	0.90						
ITA	0.89	0.90	0.87	18.94					
NLD	0.83	0.83	0.89	0.82	4.13				
USA	0.83	0.89	0.87	0.87	0.90	1.00			
DEA	0.92	0.92	0.88	0.93	0.78	0.84	11.51		
SVN	0.83	0.79	0.65	0.79	0.66	0.71	0.81	23.31	
GBR	0.80	0.80	0.86	0.86	0.91	0.93	0.74	0.64	2.86

BSW ude

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.61								
CHE	0.96	12.12							
FRA	0.95	0.95	0.98						
ITA	0.94	0.96	0.96	20.19					
NLD	0.95	0.94	0.95	0.93	4.01				
USA	0.96	0.95	0.96	0.95	0.94	1.24			
DEA	0.92	0.97	0.93	0.97	0.93	0.93	12.07		
SVN	0.93	0.96	0.91	0.96	0.94	0.92	0.96	21.37	
GBR	0.96	0.94	0.96	0.94	0.96	0.96	0.90	0.91	2.09

BSW ftp

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	7.41								
CHE	0.97	13.98							
FRA	0.97	0.95	0.92						
NLD	0.96	0.95	0.95	5.16					
USA	0.92	0.91	0.88	0.91	1.32				
DEA	0.95	0.98	0.95	0.96	0.90	11.09			
SVN	0.94	0.93	0.91	0.93	0.90	0.92	17.63		
GBR	0.95	0.93	0.89	0.94	0.94	0.91	0.93	1.38	

ITA 0.87 0.86 0.86 0.86 0.88 0.86 0.86 0.87 21.38

BSW ftl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	6.39								
CHE	0.90	14.71							
FRA	0.95	0.95	0.95						
ITA	0.93	0.94	0.95	18.30					
NLD	0.92	0.96	0.92	0.92	5.00				
USA	0.93	0.96	0.95	0.93	0.96	1.76			
DEA	0.90	0.98	0.97	0.96	0.94	0.96	11.10		
SVN	0.90	0.93	0.90	0.93	0.94	0.91	0.93	17.85	
GBR	0.95	0.94	0.93	0.94	0.97	0.96	0.93	0.93	1.45

BSW rtp

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	6.56							
CHE	0.98	14.53						
FRA	0.97	0.97	0.92					
ITA	0.92	0.95	0.93	20.33				
NLD	0.97	0.96	0.97	0.92	4.67			
DEA	0.96	0.99	0.97	0.96	0.94	11.99		
SVN	0.94	0.93	0.92	0.93	0.94	0.93	17.29	
USA	0.91	0.88	0.91	0.89	0.94	0.87	0.89	1.32

BSW ocs

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.60								
CHE	0.82	9.27							
FRA	0.75	0.84	0.94						
ITA	0.78	0.81	0.89	9.10					
NLD	0.72	0.72	0.77	0.71	3.63				
USA	0.82	0.76	0.83	0.82	0.81	0.52			
DEA	0.81	0.91	0.89	0.88	0.63	0.75	10.63		
SVN	0.64	0.65	0.73	0.70	0.66	0.68	0.76	20.07	
GBR	0.76	0.84	0.85	0.79	0.86	0.87	0.70	0.68	1.75

BSW ous

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	7.99								
CHE	0.88	13.80							
FRA	0.88	0.91	0.93						
ITA	0.82	0.88	0.91	10.29					
NLD	0.88	0.87	0.91	0.79	4.55				
USA	0.83	0.88	0.84	0.82	0.83	0.99			
DEA	0.87	0.95	0.90	0.90	0.85	0.88	12.47		
SVN	0.74	0.85	0.77	0.81	0.76	0.81	0.92	19.30	
GBR	0.78	0.84	0.75	0.80	0.76	0.86	0.75	0.73	1.58

BSW ofl

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	8.43								
CHE	0.83	11.60							
FRA	0.65	0.66	1.25						
ITA	0.64	0.70	0.85	17.36					
NLD	0.66	0.64	0.73	0.64	4.31				
USA	0.65	0.63	0.77	0.74	0.65	1.04			
DEA	0.69	0.85	0.69	0.81	0.60	0.60	11.28		
SVN	0.76	0.86	0.69	0.77	0.65	0.69	0.90	27.62	

GBR 0.66 0.75 0.81 0.66 0.73 0.71 0.65 0.62 1.53

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BSW ofr  
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	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	6.99						
CHE	0.81	12.09					
DEA	0.82	0.90	11.52				
ITA	0.79	0.91	0.94	17.15			
SVN	0.76	0.79	0.79	0.84	21.55		
USA	0.77	0.84	0.91	0.86	0.78	1.63	
FRA	0.76	0.87	0.93	0.91	0.83	0.90	0.89

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BSW tpl  
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	CAN	CHE	DEA	ITA	SVN	FRA
CAN	6.71					
CHE	0.88	12.16				
DEA	0.91	0.90	11.72			
ITA	0.92	0.91	0.94	23.84		
SVN	0.88	0.88	0.87	0.86	23.18	
FRA	0.96	0.93	0.90	0.91	0.87	1.28

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BSW oru  
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	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.05						
CHE	0.75	16.35					
DEA	0.70	0.86	12.57				
ITA	0.91	0.75	0.75	17.36			
SVN	0.83	0.58	0.67	0.75	27.50		
USA	0.89	0.57	0.48	0.83	0.69	0.97	
FRA	0.90	0.88	0.85	0.89	0.74	0.85	1.10

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BSW rle  
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	CHE	DEA	ITA	SVN	USA	FRA
CHE	11.77					
DEA	0.96	12.32				
ITA	0.83	0.86	19.62			
SVN	0.81	0.82	0.83	26.11		
USA	0.55	0.51	0.78	0.69	0.97	
FRA	0.92	0.93	0.88	0.81	0.74	1.02

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BSW thp  
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	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	7.46						
CHE	0.81	11.35					
DEA	0.76	0.84	12.14				
ITA	0.87	0.90	0.85	30.00			
SVN	0.80	0.84	0.84	0.89	36.64		
USA	0.87	0.87	0.71	0.83	0.71	1.37	
FRA	0.90	0.83	0.86	0.85	0.83	0.80	1.02

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BSW hoq  
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	CAN	CHE	DEA	ITA	SVN	FRA
CAN	7.10					
CHE	0.92	12.05				
DEA	0.91	0.89	12.51			
ITA	0.91	0.83	0.86	19.60		
SVN	0.95	0.89	0.93	0.90	21.30	



FRA 0.91 0.85 0.89 0.88 0.92 1.04

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BSW ful  
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	CHE	DEA	ITA	SVN	FRA
CHE	11.79				
DEA	0.91	12.29			
ITA	0.92	0.95	12.83		
SVN	0.80	0.88	0.85	20.42	
FRA	0.73	0.82	0.75	0.74	0.94

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BSW udb  
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	CHE	DEA	ITA	SVN	FRA
CHE	12.13				
DEA	0.97	13.23			
ITA	0.93	0.96	26.55		
SVN	0.82	0.86	0.83	25.55	
FRA	0.91	0.87	0.85	0.78	0.95

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BSW tdi  
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	CHE	DEA	ITA	SVN	FRA
CHE	15.76				
DEA	0.96	11.33			
ITA	0.94	0.95	20.61		
SVN	0.91	0.93	0.93	17.70	
FRA	0.96	0.97	0.91	0.91	0.91

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BSW tth  
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	CHE	DEA	ITA	SVN	FRA
CHE	14.49				
DEA	0.98	13.05			
ITA	0.94	0.95	23.29		
SVN	0.88	0.89	0.88	19.92	
FRA	0.93	0.93	0.94	0.88	0.88

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GUE sta  
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	CAN	GBR	USA	AUS
CAN	6.53			
GBR	0.97	1.20		
USA	0.98	0.96	2.80	
AUS	0.90	0.93	0.91	0.84

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GUE cwi  
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	CAN	GBR	USA	AUS
CAN	6.85			
GBR	0.92	1.76		
USA	0.85	0.85	1.55	
AUS	0.72	0.80	0.66	0.34

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GUE bde  
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	CAN	GBR	USA	AUS
CAN	6.36			
GBR	0.87	1.53		
USA	0.75	0.89	1.80	
AUS	0.80	0.77	0.70	0.45

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GUE	ang			
	CAN	GBR	USA	AUS
CAN	7.87			
GBR	0.89	1.70		
USA	0.88	0.91	1.91	
AUS	0.65	0.76	0.68	0.38

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GUE	ran			
	CAN	GBR	USA	AUS
CAN	6.32			
GBR	0.97	1.64		
USA	0.97	0.97	2.02	
AUS	0.90	0.93	0.90	0.76

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GUE	rwi			
	CAN	GBR	USA	AUS
CAN	6.86			
GBR	0.93	1.53		
USA	0.92	0.92	1.74	
AUS	0.85	0.84	0.78	0.64

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GUE	rls			
	CAN	GBR	USA	AUS
CAN	8.44			
GBR	0.82	1.83		
USA	0.93	0.81	0.91	
AUS	0.71	0.79	0.71	0.32

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GUE	rlr		
	CAN	USA	AUS
CAN	7.13		
USA	0.85	0.91	
AUS	0.61	0.54	0.19

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GUE	fan			
	CAN	GBR	USA	AUS
CAN	8.29			
GBR	0.80	1.70		
USA	0.84	0.76	0.88	
AUS	0.63	0.77	0.65	0.26

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GUE	fua			
	CAN	GBR	USA	AUS
CAN	7.30			
GBR	0.94	1.55		
USA	0.92	0.91	1.84	
AUS	0.79	0.78	0.77	0.38

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GUE	ruh			
	CAN	GBR	USA	AUS
CAN	6.88			
GBR	0.73	2.04		
USA	0.80	0.90	1.49	

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AUS 0.76 0.77 0.76 0.36

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GUE usu  
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	CAN	GBR	USA	AUS
CAN	6.70			
GBR	0.79	1.68		
USA	0.80	0.87	1.36	
AUS	0.77	0.78	0.75	0.29

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GUE ude  
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	CAN	GBR	USA	AUS
CAN	6.06			
GBR	0.97	1.48		
USA	0.95	0.95	1.86	
AUS	0.89	0.90	0.89	0.53

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GUE ftp  
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	CAN	GBR	USA	AUS
CAN	5.94			
GBR	0.96	1.29		
USA	0.92	0.92	1.62	
AUS	0.92	0.91	0.87	0.40

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GUE ftl  
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	CAN	GBR	USA	AUS
CAN	4.83			
GBR	0.95	1.88		
USA	0.94	0.97	2.04	
AUS	0.93	0.94	0.93	0.94

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GUE rtp  
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	CAN	AUS	USA
CAN	5.44		
AUS	0.89	0.34	
USA	0.93	0.89	1.62

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GUE ocs  
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	CAN	GBR	USA	AUS
CAN	8.07			
GBR	0.79	2.13		
USA	0.75	0.86	0.90	
AUS	0.58	0.64	0.57	0.82

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GUE ous  
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	CAN	GBR	USA	AUS
CAN	7.94			
GBR	0.78	1.54		
USA	0.87	0.82	0.83	
AUS	0.69	0.81	0.73	1.07

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GUE ofl  
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	CAN	GBR	USA	AUS
CAN	7.40			



















FRA	0.80	0.79	0.72	0.84	0.70	0.77	1.06													
GBR	0.67	0.69	0.89	0.82	0.65	0.79	0.86	1.51												
ITA	0.62	0.69	0.65	0.74	0.60	0.75	0.79	0.73	1.91											
NLD	0.85	0.82	0.69	0.82	0.78	0.70	0.82	0.78	0.64	4.34										
USA	0.66	0.78	0.50	0.78	0.73	0.73	0.76	0.69	0.75	0.68	1.58									
CZE	0.51	0.62	0.55	0.63	0.61	0.64	0.64	0.66	0.69	0.50	0.63	20.46								
IRL	0.59	0.56	0.51	0.64	0.52	0.63	0.69	0.72	0.61	0.62	0.56	0.51	1.64							
KOR	0.57	0.63	0.53	0.51	0.57	0.65	0.66	0.52	0.55	0.55	0.52	0.55	0.51	10.32						
SVN	0.75	0.68	0.57	0.69	0.70	0.69	0.77	0.67	0.67	0.60	0.65	0.70	0.53	0.56	28.86					
PRT	0.50	0.50	0.54	0.60	0.50	0.59	0.53	0.60	0.58	0.51	0.50	0.64	0.50	0.51	0.68	2.12				
EST	0.55	0.53	0.52	0.52	0.52	0.53	0.53	0.53	0.52	0.51	0.51	0.53	0.52	0.68	0.66	0.53	22.75			
HUN	0.69	0.70	0.51	0.67	0.72	0.61	0.75	0.68	0.64	0.66	0.65	0.82	0.51	0.65	0.74	0.57	0.60	1.18		
POL	0.51	0.55	0.51	0.65	0.50	0.55	0.66	0.55	0.62	0.50	0.68	0.72	0.50	0.51	0.76	0.50	0.53	0.66	15.78	

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HOL      bcs  
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	BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	JPN	IRL	KOR	CAN	PRT	ESP	SVN	EST	HUN	NZL	POL
BEL	0.99																				
CHE	0.72	11.76																			
DEU	0.72	0.90	13.42																		
DFS	0.77	0.90	0.95	12.18																	
FRA	0.74	0.93	0.95	0.95	0.99																
GBR	0.76	0.91	0.90	0.90	0.93	1.61															
ITA	0.72	0.91	0.95	0.95	0.96	0.90	6.65														
NLD	0.72	0.93	0.95	0.95	0.95	0.91	0.94	5.01													
USA	0.77	0.72	0.80	0.80	0.80	0.76	0.77	0.76	1.38												
CZE	0.74	0.87	0.96	0.95	0.92	0.89	0.94	0.93	0.76	13.80											
JPN	0.81	0.92	0.97	0.97	0.97	0.92	0.96	0.95	0.84	0.95	1.69										
IRL	0.72	0.87	0.79	0.85	0.88	0.93	0.83	0.85	0.72	0.77	0.86	0.99									
KOR	0.73	0.75	0.85	0.86	0.86	0.81	0.85	0.80	0.74	0.86	0.87	0.73	2.46								
CAN	0.74	0.93	0.96	0.94	0.95	0.95	0.94	0.95	0.81	0.94	0.98	0.87	0.84	6.00							
PRT	0.72	0.86	0.87	0.86	0.89	0.87	0.84	0.86	0.72	0.83	0.87	0.81	0.83	0.88	1.82						
ESP	0.74	0.88	0.92	0.93	0.95	0.93	0.92	0.91	0.75	0.91	0.94	0.83	0.87	0.95	0.88	1.03					
SVN	0.73	0.88	0.91	0.91	0.89	0.81	0.89	0.91	0.73	0.90	0.89	0.75	0.78	0.85	0.75	0.85	21.35				
EST	0.73	0.83	0.89	0.87	0.87	0.76	0.86	0.90	0.82	0.86	0.87	0.73	0.74	0.84	0.78	0.87	16.40				
HUN	0.73	0.87	0.94	0.92	0.93	0.87	0.94	0.89	0.75	0.95	0.93	0.76	0.85	0.93	0.84	0.91	0.86	0.82	0.99		
NZL	0.71	0.90	0.92	0.92	0.93	0.92	0.91	0.88	0.74	0.89	0.92	0.88	0.80	0.92	0.85	0.88	0.84	0.81	0.89	0.16	
POL	0.74	0.86	0.92	0.89	0.91	0.89	0.91	0.87	0.75	0.92	0.92	0.80	0.79	0.91	0.86	0.88	0.85	0.78	0.91	0.85	11.26

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JER      sta  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.54									
CAN	0.89	6.70								
DFS	0.91	0.96	11.78							
GBR	0.91	0.96	0.94	1.07						
ITA	0.89	0.94	0.93	0.94	1.43					
NZL	0.87	0.84	0.85	0.90	0.85	0.36				
USA	0.90	0.97	0.95	0.96	0.93	0.88	1.68			
ZAF	0.87	0.85	0.85	0.92	0.85	0.89	0.86	8.90		
NLD	0.89	0.95	0.97	0.94	0.92	0.85	0.93	0.87	5.19	
CHE	0.90	0.96	0.96	0.95	0.93	0.85	0.94	0.87	0.97	10.97

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JER      cwi  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.30									
CAN	0.73	6.55								
DFS	0.74	0.83	15.62							
GBR	0.81	0.91	0.85	1.81						
ITA	0.65	0.80	0.71	0.74	1.62					
NZL	0.80	0.71	0.67	0.76	0.66	0.37				
USA	0.73	0.90	0.81	0.84	0.91	0.67	1.03			
ZAF	0.69	0.79	0.72	0.82	0.76	0.77	0.78	8.60		
NLD	0.74	0.91	0.89	0.90	0.72	0.70	0.83	0.81	4.44	
CHE	0.67	0.87	0.86	0.83	0.83	0.68	0.87	0.72	0.86	12.03

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JER	bde									
	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0.33									
CAN	0.75	5.66								
DFS	0.77	0.86	13.64							
GBR	0.74	0.85	0.85	1.53						
ITA	0.70	0.74	0.77	0.83	1.62					
NZL	0.78	0.69	0.70	0.69	0.70	0.37				
ZAF	0.80	0.73	0.83	0.81	0.72	0.77	8.79			
NLD	0.70	0.82	0.84	0.89	0.87	0.70	0.78	4.65		
USA	0.69	0.70	0.74	0.77	0.91	0.69	0.72	0.87	1.03	
CHE	0.76	0.87	0.91	0.89	0.85	0.71	0.82	0.90	0.85	13.31

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JER	ang									
	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.33									
CAN	0.66	7.56								
DFS	0.70	0.82	13.23							
GBR	0.79	0.81	0.86	1.22						
ITA	0.69	0.83	0.83	0.86	1.62					
USA	0.70	0.83	0.86	0.83	0.77	1.03				
ZAF	0.62	0.63	0.67	0.80	0.72	0.67	8.71			
NLD	0.72	0.82	0.73	0.82	0.78	0.73	0.65	6.19		
CHE	0.63	0.80	0.71	0.72	0.74	0.72	0.65	0.74	9.53	

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JER	ran									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.36									
CAN	0.89	5.87								
DFS	0.90	0.97	11.54							
GBR	0.94	0.95	0.95	1.20						
ITA	0.89	0.95	0.94	0.94	1.32					
NZL	0.90	0.88	0.88	0.92	0.88	0.30				
USA	0.90	0.95	0.96	0.97	0.93	0.91	1.24			
ZAF	0.89	0.89	0.89	0.90	0.88	0.88	0.89	8.97		
NLD	0.90	0.96	0.96	0.96	0.94	0.89	0.95	0.92	4.69	
CHE	0.91	0.96	0.96	0.95	0.94	0.89	0.94	0.90	0.95	12.94

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JER	rwi									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.32									
CAN	0.81	6.35								
DFS	0.81	0.91	12.08							
GBR	0.80	0.92	0.85	1.37						
ITA	0.78	0.85	0.82	0.85	1.79					
NZL	0.88	0.83	0.82	0.80	0.79	0.30				
USA	0.78	0.82	0.82	0.84	0.85	0.78	1.00			
ZAF	0.78	0.79	0.79	0.80	0.79	0.77	0.79	9.24		
NLD	0.85	0.94	0.91	0.88	0.80	0.85	0.81	0.80	5.02	
CHE	0.83	0.93	0.84	0.87	0.80	0.81	0.80	0.79	0.92	12.25

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JER	rls									
	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.18									
CAN	0.67	6.14								
DFS	0.69	0.91	12.63							
GBR	0.72	0.85	0.76	1.74						
ITA	0.68	0.83	0.82	0.77	1.97					

NZL	0.66	0.67	0.67	0.69	0.68	0.12				
USA	0.68	0.94	0.89	0.88	0.82	0.66	0.89			
ZAF	0.72	0.68	0.68	0.77	0.73	0.83	0.74	11.87		
NLD	0.73	0.92	0.91	0.85	0.85	0.67	0.87	0.74	3.57	
CHE	0.76	0.92	0.85	0.82	0.80	0.69	0.86	0.72	0.90	9.37

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JER      rlr  
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	AUS	CAN	DFS	ITA	ZAF	NLD	USA	CHE		
AUS	0.21									
CAN	0.52	6.53								
DFS	0.54	0.77	13.65							
ITA	0.55	0.81	0.65	1.29						
ZAF	0.52	0.56	0.53	0.61	12.54					
NLD	0.57	0.86	0.88	0.73	0.63	4.66				
USA	0.51	0.73	0.64	0.82	0.53	0.74	0.89			
CHE	0.65	0.68	0.63	0.62	0.55	0.70	0.58	11.96		

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JER      fan  
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	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.22									
CAN	0.62	6.26								
DFS	0.63	0.87	12.76							
GBR	0.72	0.79	0.75	1.50						
ITA	0.63	0.76	0.69	0.76	2.01					
USA	0.63	0.88	0.80	0.85	0.84	0.89				
ZAF	0.66	0.65	0.68	0.84	0.66	0.75	9.65			
NLD	0.68	0.75	0.78	0.86	0.72	0.77	0.71	3.97		
CHE	0.66	0.79	0.80	0.69	0.68	0.71	0.67	0.73	12.09	

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JER      fua  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.37									
CAN	0.74	5.71								
DFS	0.72	0.86	12.85							
GBR	0.76	0.94	0.86	1.63						
ITA	0.68	0.86	0.77	0.87	1.49					
NZL	0.79	0.72	0.74	0.81	0.70	0.42				
USA	0.75	0.94	0.87	0.92	0.90	0.72	1.48			
ZAF	0.72	0.91	0.87	0.93	0.82	0.74	0.89	11.83		
NLD	0.76	0.92	0.89	0.92	0.83	0.82	0.87	0.87	4.66	
CHE	0.79	0.91	0.85	0.87	0.82	0.71	0.86	0.88	0.90	11.80

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JER      ruh  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.35									
CAN	0.73	6.87								
DFS	0.74	0.84	10.66							
GBR	0.80	0.80	0.82	1.33						
ITA	0.74	0.76	0.81	0.85	1.73					
NZL	0.72	0.72	0.76	0.76	0.78	0.41				
USA	0.77	0.84	0.89	0.91	0.84	0.74	1.26			
ZAF	0.82	0.73	0.79	0.87	0.82	0.77	0.85	9.20		
NLD	0.75	0.76	0.91	0.88	0.83	0.82	0.86	0.78	4.26	
CHE	0.79	0.92	0.86	0.83	0.77	0.77	0.85	0.77	0.83	12.86

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JER      usu  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.38									
CAN	0.75	6.46								

DFS	0.71	0.85	13.49								
GBR	0.79	0.87	0.85	1.73							
ITA	0.65	0.78	0.74	0.84	1.88						
NZL	0.59	0.59	0.59	0.64	0.68	0.40					
USA	0.73	0.83	0.88	0.84	0.82	0.60	0.99				
ZAF	0.77	0.79	0.73	0.81	0.64	0.59	0.77	10.06			
NLD	0.81	0.83	0.88	0.91	0.80	0.60	0.88	0.79	4.83		
CHE	0.75	0.90	0.86	0.80	0.79	0.61	0.83	0.77	0.86	10.10	

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JER ude  
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	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	
AUS	0.35									
CAN	0.91	5.38								
DFS	0.89	0.93	12.17							
GBR	0.89	0.97	0.92	1.45						
ITA	0.91	0.94	0.94	0.92	1.43					
USA	0.89	0.96	0.95	0.94	0.95	1.77				
ZAF	0.88	0.89	0.91	0.91	0.89	0.89	10.41			
NLD	0.90	0.96	0.95	0.96	0.95	0.95	0.91	4.15		
CHE	0.94	0.95	0.94	0.92	0.95	0.94	0.90	0.96	9.82	

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JER ftp  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0.46									
CAN	0.89	6.38								
DFS	0.88	0.92	12.77							
GBR	0.90	0.94	0.89	1.35						
ITA	0.87	0.87	0.86	0.86	2.03					
NZL	0.87	0.92	0.87	0.88	0.87	0.30				
USA	0.86	0.95	0.91	0.93	0.87	0.88	1.33			
ZAF	0.87	0.93	0.88	0.93	0.87	0.90	0.90	10.18		
NLD	0.93	0.97	0.94	0.94	0.86	0.90	0.90	0.90	5.51	
CHE	0.92	0.95	0.92	0.90	0.87	0.88	0.90	0.88	0.96	9.95

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JER ftl  
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	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	NZL
AUS	0.33									
CAN	0.91	5.56								
DFS	0.92	0.91	13.84							
GBR	0.92	0.93	0.94	1.49						
ITA	0.90	0.92	0.91	0.93	1.87					
USA	0.90	0.92	0.94	0.97	0.92	1.10				
ZAF	0.92	0.91	0.92	0.95	0.90	0.96	10.87			
NLD	0.93	0.93	0.97	0.97	0.91	0.95	0.93	4.62		
CHE	0.92	0.92	0.94	0.96	0.90	0.94	0.93	0.96	11.56	
NZL	0.92	0.94	0.92	0.94	0.91	0.93	0.93	0.92	0.92	0.53

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JER rtp  
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	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE	
AUS	0.32								
CAN	0.87	6.35							
DFS	0.88	0.94	13.16						
NZL	0.87	0.96	0.91	0.42					
ZAF	0.87	0.91	0.89	0.87	9.40				
NLD	0.90	0.97	0.95	0.92	0.88	5.01			
USA	0.87	0.92	0.95	0.87	0.87	0.94	1.35		
CHE	0.90	0.97	0.95	0.94	0.93	0.96	0.92	10.82	

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JER ocs  
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	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0.78								
CAN	0.55	5.29							
DFS	0.52	0.64	12.69						
GBR	0.63	0.77	0.82	2.67					
ITA	0.50	0.74	0.72	0.80	0.78				
NZL	0.62	0.56	0.46	0.55	0.53	0.31			
USA	0.63	0.79	0.70	0.85	0.78	0.57	0.88		
NLD	0.59	0.73	0.85	0.87	0.79	0.63	0.82	3.03	
CHE	0.58	0.85	0.76	0.89	0.82	0.53	0.78	0.82	8.02

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JER      ous  
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	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE
AUS	0.78							
CAN	0.68	6.39						
DFS	0.64	0.81	12.80					
GBR	0.73	0.82	0.70	1.43				
NZL	0.81	0.74	0.68	0.74	0.45			
USA	0.67	0.89	0.76	0.83	0.71	1.04		
NLD	0.67	0.88	0.89	0.76	0.78	0.85	4.32	
CHE	0.75	0.88	0.80	0.86	0.78	0.86	0.92	10.81

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JER      ofl  
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	AUS	CAN	DFS	GBR	ITA	USA	NLD	CHE
AUS	6.32							
CAN	0.49	5.01						
DFS	0.38	0.74	13.64					
GBR	0.58	0.65	0.64	1.32				
ITA	0.44	0.64	0.60	0.70	1.07			
USA	0.66	0.73	0.62	0.68	0.76	1.62		
NLD	0.43	0.68	0.64	0.73	0.67	0.66	4.70	
CHE	0.51	0.83	0.71	0.70	0.68	0.74	0.70	10.91

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RDC      sta  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.66										
CAN	0.88	6.28									
DEU	0.89	0.97	13.48								
DFS	0.87	0.96	0.97	8.64							
GBR	0.92	0.96	0.96	0.93	1.29						
NOR	0.87	0.93	0.94	0.98	0.92	13.56					
NZL	0.88	0.89	0.86	0.89	0.92	0.92	0.49				
USA	0.90	0.97	0.96	0.94	0.97	0.91	0.89	2.35			
NLD	0.88	0.95	0.97	0.97	0.94	0.96	0.84	0.93	4.75		
CAM	0.92	0.91	0.91	0.91	0.91	0.91	0.91	0.90	0.90	5.65	
LVA	0.86	0.85	0.86	0.92	0.84	0.91	0.86	0.84	0.86	0.90	0.63

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RDC      cwi  
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	AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA
AUS	0.40										
CAN	0.73	7.10									
DEU	0.71	0.88	11.39								
DFS	0.77	0.82	0.89	13.70							
GBR	0.82	0.88	0.89	0.87	1.58						
NZL	0.80	0.69	0.71	0.68	0.81	0.35					
USA	0.67	0.84	0.81	0.83	0.83	0.70	1.29				
NLD	0.72	0.92	0.92	0.89	0.91	0.69	0.81	4.64			
CAM	0.78	0.79	0.79	0.79	0.79	0.82	0.79	0.80	6.79		
NOR	0.81	0.80	0.81	0.87	0.82	0.80	0.82	0.87	0.80	14.24	
LVA	0.68	0.74	0.69	0.67	0.67	0.70	0.67	0.74	0.79	0.80	0.30





DEU	0.73	0.94	9.38								
DFS	0.70	0.97	0.94	9.28							
GBR	0.79	0.77	0.85	0.78	1.57						
NOR	0.74	0.87	0.86	0.94	0.80	11.83					
NZL	0.69	0.67	0.68	0.67	0.71	0.74	0.12				
USA	0.70	0.92	0.93	0.93	0.82	0.83	0.67	0.90			
NLD	0.73	0.92	0.93	0.89	0.86	0.80	0.66	0.90	5.12		
CAM	0.81	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	6.88	
LVA	0.70	0.78	0.83	0.76	0.75	0.72	0.72	0.77	0.82	0.80	0.28

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RDC      rlr  
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	AUS	CAN	DEU	DFS	NOR	NLD	USA	CAM	LVA		
AUS	0.20										
CAN	0.58	6.58									
DEU	0.61	0.87	10.34								
DFS	0.56	0.82	0.90	10.93							
NOR	0.59	0.75	0.80	0.83	13.29						
NLD	0.58	0.87	0.90	0.88	0.81	4.73					
USA	0.55	0.72	0.77	0.67	0.71	0.80	0.90				
CAM	0.76	0.72	0.73	0.71	0.71	0.71	0.71	6.98			
LVA	0.59	0.73	0.77	0.82	0.66	0.70	0.71	0.73	0.24		

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RDC      fan  
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	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	
AUS	0.29										
CAN	0.65	6.28									
DEU	0.70	0.81	13.83								
DFS	0.63	0.70	0.80	9.34							
GBR	0.74	0.79	0.91	0.73	1.59						
NOR	0.69	0.73	0.84	0.62	0.77	12.85					
USA	0.68	0.85	0.83	0.72	0.83	0.77	1.07				
NLD	0.68	0.75	0.89	0.78	0.88	0.66	0.80	4.90			
CAM	0.80	0.79	0.77	0.77	0.77	0.77	0.79	0.79	8.10		
LVA	0.67	0.65	0.68	0.63	0.69	0.74	0.69	0.68	0.79	0.27	

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RDC      fua  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.39										
CAN	0.77	5.64									
DEU	0.74	0.90	12.45								
DFS	0.72	0.80	0.84	11.69							
GBR	0.77	0.88	0.95	0.87	1.54						
NOR	0.70	0.82	0.76	0.85	0.80	11.98					
NZL	0.77	0.81	0.81	0.69	0.78	0.72	0.36				
USA	0.75	0.93	0.90	0.85	0.92	0.80	0.84	1.50			
NLD	0.76	0.92	0.93	0.88	0.93	0.88	0.84	0.88	3.99		
CAM	0.82	0.81	0.79	0.80	0.79	0.80	0.79	0.81	0.81	6.65	
LVA	0.68	0.75	0.77	0.80	0.74	0.74	0.73	0.69	0.77	0.78	0.36

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RDC      ruh  
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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.47										
CAN	0.78	5.69									
DEU	0.80	0.87	14.67								
DFS	0.77	0.87	0.90	10.75							
GBR	0.79	0.75	0.85	0.85	1.44						
NOR	0.76	0.84	0.88	0.88	0.82	12.22					
NZL	0.83	0.75	0.82	0.77	0.92	0.77	0.33				
USA	0.77	0.84	0.90	0.92	0.89	0.84	0.85	1.36			
NLD	0.75	0.75	0.91	0.91	0.88	0.91	0.83	0.86	4.16		
CAM	0.85	0.83	0.82	0.83	0.84	0.82	0.85	0.83	0.82	6.24	

LVA 0.73 0.73 0.76 0.84 0.73 0.75 0.75 0.73 0.76 0.82 0.39

RDC usu

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.34										
CAN	0.75	5.71									
DEU	0.72	0.89	12.65								
DFS	0.67	0.76	0.78	13.07							
GBR	0.80	0.80	0.75	0.79	1.86						
NOR	0.67	0.71	0.67	0.73	0.76	11.99					
NZL	0.68	0.71	0.62	0.60	0.68	0.69	0.32				
USA	0.78	0.82	0.75	0.85	0.89	0.78	0.70	1.20			
NLD	0.78	0.83	0.80	0.90	0.91	0.81	0.58	0.90	4.52		
CAM	0.80	0.78	0.76	0.76	0.78	0.76	0.79	0.78	0.77	6.25	
LVA	0.63	0.65	0.62	0.60	0.75	0.70	0.68	0.70	0.68	0.76	0.32

RDC ude

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA
AUS	0.53									
CAN	0.89	5.67								
DEU	0.90	0.97	12.66							
DFS	0.89	0.96	0.94	10.66						
GBR	0.90	0.96	0.96	0.93	1.84					
NOR	0.90	0.91	0.90	0.88	0.92	14.14				
USA	0.88	0.96	0.96	0.95	0.96	0.92	1.30			
NLD	0.90	0.97	0.97	0.95	0.97	0.91	0.96	4.12		
CAM	0.93	0.93	0.93	0.93	0.93	0.92	0.93	0.93	4.54	
LVA	0.89	0.89	0.88	0.91	0.88	0.89	0.88	0.88	0.92	0.42

RDC ftp

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0.54										
CAN	0.92	5.66									
DEU	0.93	0.97	13.02								
DFS	0.89	0.94	0.92	11.92							
GBR	0.91	0.93	0.95	0.89	1.49						
NOR	0.89	0.91	0.89	0.94	0.91	14.20					
NZL	0.92	0.90	0.90	0.87	0.89	0.89	0.26				
USA	0.87	0.92	0.91	0.92	0.93	0.92	0.87	1.44			
NLD	0.93	0.98	0.97	0.95	0.94	0.88	0.90	0.90	4.62		
CAM	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.78	
LVA	0.88	0.87	0.87	0.87	0.87	0.88	0.88	0.86	0.87	0.91	0.39

RDC ftl

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	NZL
AUS	0.56										
CAN	0.93	4.95									
DEU	0.93	0.94	14.08								
DFS	0.92	0.90	0.97	10.59							
GBR	0.95	0.93	0.98	0.93	1.40						
NOR	0.92	0.92	0.93	0.93	0.94	12.52					
USA	0.94	0.93	0.96	0.92	0.97	0.94	1.64				
NLD	0.93	0.93	0.98	0.97	0.97	0.95	0.95	5.17			
CAM	0.94	0.94	0.94	0.93	0.94	0.94	0.94	0.94	7.25		
LVA	0.90	0.91	0.90	0.90	0.90	0.94	0.89	0.90	0.93	0.48	
NZL	0.94	0.93	0.92	0.92	0.93	0.93	0.92	0.92	0.94	0.92	0.37

RDC rtp

	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM	LVA
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

AUS	0.38									
CAN	0.89	5.98								
DEU	0.89	0.96	14.12							
DFS	0.88	0.93	0.96	12.29						
NOR	0.89	0.90	0.89	0.87	13.08					
NZL	0.92	0.95	0.93	0.88	0.89	0.34				
NLD	0.90	0.98	0.97	0.96	0.89	0.94	5.31			
USA	0.88	0.91	0.95	0.92	0.92	0.89	0.96	1.44		
CAM	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	6.29	
LVA	0.91	0.91	0.89	0.90	0.88	0.91	0.93	0.88	0.91	0.38

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RDC      ocs

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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.13									
CAN	0.63	4.78								
DEU	0.59	0.76	20.59							
DFS	0.65	0.62	0.79	10.50						
GBR	0.66	0.75	0.91	0.76	1.62					
NOR	0.56	0.69	0.69	0.77	0.76	16.30				
NZL	0.72	0.57	0.60	0.48	0.66	0.58	0.27			
USA	0.63	0.78	0.88	0.74	0.88	0.75	0.69	0.57		
NLD	0.61	0.72	0.88	0.82	0.88	0.71	0.63	0.85	2.98	
CAM	0.72	0.77	0.76	0.77	0.77	0.75	0.72	0.79	0.79	6.32

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RDC      ous

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	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	1.45									
CAN	0.71	5.39								
DEU	0.75	0.88	17.24							
DFS	0.66	0.79	0.82	10.79						
GBR	0.83	0.80	0.83	0.73	1.60					
NOR	0.71	0.80	0.80	0.78	0.82	13.66				
NZL	0.83	0.81	0.79	0.75	0.81	0.75	0.36			
USA	0.74	0.88	0.86	0.86	0.87	0.83	0.87	1.00		
NLD	0.68	0.88	0.91	0.88	0.76	0.80	0.80	0.84	3.86	
CAM	0.82	0.84	0.84	0.83	0.84	0.82	0.84	0.85	0.85	6.58

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RDC      ofl

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	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM
AUS	0.63								
CAN	0.39	4.41							
DEU	0.41	0.76	16.29						
DFS	0.38	0.80	0.80	13.63					
GBR	0.50	0.69	0.73	0.67	1.42				
NOR	0.49	0.70	0.67	0.58	0.75	12.98			
USA	0.54	0.64	0.74	0.64	0.69	0.75	1.33		
NLD	0.43	0.68	0.75	0.64	0.74	0.64	0.67	6.47	
CAM	0.72	0.75	0.75	0.75	0.75	0.75	0.77	0.75	7.05

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^LAPPENDIX II. Number of common bulls

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BSW

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common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	131	76	133	40	152	117	31	20
CHE	115	0	158	483	68	272	530	67	18
FRA	66	121	0	179	57	89	177	49	14
ITA	115	423	143	0	90	212	582	88	19
NLD	32	65	45	71	0	58	83	34	12

USA	143	241	62	154	44	0	228	33	20
DEA	99	435	134	500	73	183	0	85	15
SVN	28	65	47	84	33	28	80	0	9
GBR	17	16	13	17	10	18	13	7	0

BSW

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common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	123	45	133	33	152	115	30	20
CHE	108	0	96	428	63	243	467	64	18
FRA	39	70	0	107	39	53	116	40	10
ITA	115	369	84	0	82	212	546	86	19
NLD	28	62	33	67	0	44	77	34	12
USA	143	208	36	154	35	0	210	32	20
DEA	98	376	85	463	71	158	0	83	14
SVN	27	62	39	82	33	27	79	0	9
GBR	17	16	9	17	10	18	13	7	0

BSW

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common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	GBR	USA
CAN	0	131	76	133	33	117	24	20	152
CHE	115	0	158	483	67	530	52	18	272
FRA	66	121	0	179	53	177	36	14	89
ITA	115	423	143	0	82	582	69	19	212
NLD	28	65	42	67	0	78	26	12	44
DEA	99	435	134	500	72	0	64	15	228
SVN	22	49	36	64	26	60	0	7	24
GBR	17	16	13	17	10	13	5	0	20
USA	143	241	62	154	35	183	21	18	0

BSW

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common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	GBR
CAN	0	130	76	21	151	20
CHE	115	0	154	44	270	18
FRA	66	117	0	35	89	14
NLD	18	45	29	0	29	9
USA	142	241	62	24	0	20
GBR	17	16	13	7	18	0

BSW

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common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	131	76	133	40	152	117	31	20
CHE	115	0	158	483	68	272	530	67	18
FRA	66	121	0	179	57	89	177	49	14
ITA	115	423	143	0	90	212	582	88	19
NLD	32	65	45	71	0	58	83	34	12
USA	143	241	62	154	44	0	228	33	20
DEA	99	435	134	500	73	183	0	85	15
SVN	28	65	47	84	33	28	80	0	9
GBR	17	16	13	17	10	18	13	7	0

BSW

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common bulls below diagonal

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common three quarter sib group above diagonal
  CAN CHE FRA NLD USA DEA GBR SVN ITA
-----
CAN  0 131 45 40 152 117 20 24 129
CHE 115  0 96 68 272 530 18 52 476
FRA 39 70  0 39 53 116 10 36 107
NLD 32 65 33  0 58 83 12 26 88
USA 143 241 36 44  0 228 20 24 198
DEA 99 435 85 73 183  0 15 64 576
GBR 17 16  9 10 18 13  0 7 19
SVN 22 49 36 26 21 60 5  0 69
ITA 112 417 84 70 140 492 17 64  0
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BSW

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common bulls below diagonal
common three quarter sib group above diagonal
  CAN CHE FRA ITA NLD USA DEA SVN GBR
-----
CAN  0 131 76 133 40 152 117 31 20
CHE 115  0 158 483 68 272 530 67 18
FRA 66 121  0 179 57 89 177 49 14
ITA 115 423 143  0 90 212 582 88 19
NLD 32 65 45 71  0 58 83 34 12
USA 143 241 62 154 44  0 228 33 20
DEA 99 435 134 500 73 183  0 85 15
SVN 28 65 47 84 33 28 80  0 9
GBR 17 16 13 17 10 18 13  7 0
-----

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BSW

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common bulls below diagonal
common three quarter sib group above diagonal
  CAN CHE FRA ITA NLD USA DEA SVN GBR
-----
CAN  0 131 76 133 32 152 117 31 20
CHE 115  0 158 483 66 272 530 67 18
FRA 66 121  0 179 53 89 177 49 14
ITA 115 423 143  0 81 212 582 88 19
NLD 27 64 42 66  0 43 77 34 12
USA 143 241 62 154 33  0 228 33 20
DEA 99 435 134 500 71 183  0 85 15
SVN 28 65 47 84 33 28 80  0 9
GBR 17 16 13 17 10 18 13  7 0
-----

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BSW

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common bulls below diagonal
common three quarter sib group above diagonal
  CAN CHE FRA ITA NLD USA DEA SVN USA
-----
CAN  0 131 76 129 32 117 31 152
CHE 115  0 158 477 66 530 67 272
FRA 66 121  0 178 53 177 49 89
ITA 112 418 143  0 80 576 88 198
NLD 27 64 42 65  0 77 34 43
DEA 99 435 134 492 71  0 85 228
SVN 28 65 47 84 33 80  0 33
USA 143 241 62 140 33 183 28  0
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BSW

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common bulls below diagonal
common three quarter sib group above diagonal
  CAN CHE FRA ITA NLD USA DEA SVN GBR
-----
CAN  0 131 45 90 32 152 84 24 20
CHE 115  0 96 312 67 271 336 53 18
FRA 39 70  0 99 38 53 106 37 10
-----

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ITA	80	262	77	0	61	114	299	63	16
NLD	27	65	32	55	0	43	65	27	12
USA	143	241	36	81	34	0	131	25	20
DEA	73	269	78	266	60	94	0	64	12
SVN	22	50	37	59	27	22	61	0	7
GBR	17	16	9	14	10	18	11	5	0

BSW

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	131	76	133	33	152	117	31	20
CHE	115	0	158	483	67	272	530	67	18
FRA	66	121	0	179	53	89	177	49	14
ITA	115	423	143	0	82	212	582	88	19
NLD	28	65	42	67	0	44	78	34	12
USA	143	241	62	154	35	0	228	33	20
DEA	99	435	134	500	72	183	0	85	15
SVN	28	65	47	84	33	28	80	0	9
GBR	17	16	13	17	10	18	13	7	0

BSW

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN
CAN	0	131	76	133	33	152	117	31
CHE	115	0	158	483	67	272	530	67
FRA	66	121	0	179	53	89	177	49
ITA	115	423	143	0	82	212	582	88
NLD	28	65	42	67	0	44	78	34
USA	143	241	62	154	35	0	228	33
DEA	99	435	134	500	72	183	0	85
SVN	28	65	47	84	33	28	80	0

BSW

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	131	76	133	40	152	117	24	20
CHE	115	0	158	483	68	272	530	53	18
FRA	66	121	0	179	57	89	177	37	14
ITA	115	423	143	0	90	212	582	70	19
NLD	32	65	45	71	0	58	83	27	12
USA	143	241	62	154	44	0	228	25	20
DEA	99	435	134	500	73	183	0	66	15
SVN	22	50	37	65	27	22	63	0	7
GBR	17	16	13	17	10	18	13	5	0

BSW

common bulls below diagonal

common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	131	76	133	40	150	117	31	20
CHE	115	0	158	483	68	272	530	67	18
FRA	66	121	0	179	57	89	177	49	14
ITA	115	423	143	0	90	212	582	88	19
NLD	32	65	45	71	0	58	83	34	12
USA	142	241	62	154	44	0	228	33	20
DEA	99	435	134	500	73	183	0	85	15
SVN	28	65	47	84	33	28	80	0	9
GBR	17	16	13	17	10	18	13	7	0

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	NLD	USA	DEA	SVN	GBR	ITA
CAN	0	131	76	40	152	106	30	20	121
CHE	115	0	158	68	272	498	65	18	441
FRA	66	121	0	57	89	167	48	14	166
NLD	32	65	45	0	58	77	34	12	80
USA	143	241	62	44	0	203	32	20	168
DEA	91	404	126	71	155	0	83	14	488
SVN	27	63	46	33	27	79	0	9	85
GBR	17	16	13	10	18	13	7	0	19
ITA	105	386	131	66	121	427	81	17	0

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BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	131	76	133	40	152	117	30	20
CHE	115	0	158	483	68	272	530	66	18
FRA	66	121	0	179	57	89	177	48	14
ITA	115	423	143	0	90	210	582	87	19
NLD	32	65	45	71	0	58	83	34	12
USA	143	241	62	153	44	0	228	32	20
DEA	99	435	134	500	73	183	0	84	15
SVN	27	64	46	83	33	27	79	0	9
GBR	17	16	13	17	10	18	13	7	0

-----

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	DEA	SVN	USA
CAN	0	131	76	90	28	84	30	152
CHE	115	0	155	312	63	336	65	271
FRA	66	118	0	119	50	126	48	89
ITA	80	262	91	0	60	299	73	114
NLD	24	63	40	55	0	64	33	38
DEA	73	269	89	266	60	0	76	131
SVN	27	63	46	70	33	70	0	31
USA	143	241	62	81	30	94	27	0

-----

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	123	66	133	40	152	84	24	20
CHE	108	0	121	427	63	243	331	53	18
FRA	60	93	0	146	47	74	115	37	14
ITA	115	367	119	0	88	209	335	70	19
NLD	32	62	40	71	0	58	65	27	12
USA	143	208	55	154	44	0	131	24	20
DEA	73	265	86	301	60	94	0	64	12
SVN	22	50	37	65	27	21	61	0	7
GBR	17	16	13	17	10	18	11	5	0

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BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
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CAN	0	123	66	133	40	150	117	24	20
CHE	108	0	121	428	63	241	475	53	18
FRA	60	93	0	146	47	74	147	37	14
ITA	115	369	119	0	90	212	575	70	19
NLD	32	62	40	71	0	58	83	27	12
USA	141	206	55	154	44	0	226	25	20
DEA	98	386	112	496	73	179	0	66	15
SVN	22	50	37	65	27	22	63	0	7
GBR	17	16	13	17	10	18	13	5	0

BSW

-----

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	FRA	ITA	NLD	USA	DEA	SVN	GBR
CAN	0	123	66	129	40	151	117	24	20
CHE	108	0	121	427	63	241	475	53	18
FRA	60	93	0	145	47	74	147	37	14
ITA	112	368	119	0	88	198	570	70	19
NLD	32	62	40	70	0	58	83	27	12
USA	142	206	55	140	44	0	226	24	20
DEA	98	386	112	489	73	179	0	66	15
SVN	22	50	37	65	27	21	63	0	7
GBR	17	16	13	17	10	18	13	5	0

BSW

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BSW

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BSW

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common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	122	116	91	24	153	46
CHE	107	0	469	312	53	242	96
DEA	99	383	0	340	66	222	116
ITA	81	261	291	0	63	114	99
SVN	22	50	63	59	0	25	37
USA	143	208	178	81	22	0	53
FRA	40	70	85	77	37	36	0

BSW

-----

common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	129	118	134	31	77	
CHE	114	0	530	483	66	158	
DEA	99	435	0	580	85	177	
ITA	116	423	499	0	87	179	
SVN	28	65	80	84	0	49	
FRA	67	121	134	143	47	0	

BSW

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common bulls below diagonal  
common three quarter sib group above diagonal

	CAN	CHE	DEA	ITA	SVN	USA	FRA
CAN	0	122	94	91	24	153	46
CHE	107	0	366	312	53	242	96
DEA	83	296	0	306	65	159	108
ITA	81	261	273	0	63	114	99
SVN	22	50	62	59	0	25	37

USA	143	208	118	81	22	0	53
FRA	40	70	80	77	37	36	0

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CHE DEA ITA SVN USA FRA

CHE	0	512	312	52	271	156
DEA	420	0	339	64	213	173
ITA	262	290	0	62	114	119
SVN	49	60	58	0	24	36
USA	241	167	81	21	0	88
FRA	120	132	91	36	62	0

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CAN CHE DEA ITA SVN USA FRA

CAN	0	79	68	72	22	85	34
CHE	68	0	366	312	50	242	96
DEA	57	296	0	306	61	159	108
ITA	64	261	273	0	57	114	99
SVN	20	48	58	54	0	23	36
USA	76	208	118	81	20	0	53
FRA	28	70	80	77	36	36	0

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CAN CHE DEA ITA SVN FRA

CAN	0	129	118	130	30	77
CHE	114	0	530	477	64	158
DEA	99	435	0	574	84	177
ITA	113	418	491	0	85	178
SVN	27	63	79	82	0	48
FRA	67	121	134	143	46	0

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CHE DEA ITA SVN FRA

CHE	0	529	480	52	155
DEA	434	0	580	66	176
ITA	420	499	0	69	177
SVN	50	63	65	0	37
FRA	120	133	143	37	0

BSW

-----  
common bulls below diagonal  
common three quarter sib group above diagonal  
CHE DEA ITA SVN FRA

CHE	0	302	287	51	109
DEA	254	0	297	64	125
ITA	246	266	0	63	118
SVN	49	61	59	0	37
FRA	83	88	91	37	0

BSW

common bulls below diagonal  
common three quarter sib group above diagonal  
CHE DEA ITA SVN FRA

---

CHE	0	529	474	65	155
DEA	434	0	574	84	176
ITA	415	491	0	86	176
SVN	64	79	83	0	48
FRA	120	133	143	46	0

---

BSW

common bulls below diagonal  
common three quarter sib group above diagonal  
CHE DEA ITA SVN FRA

---

CHE	0	335	310	65	92
DEA	268	0	298	76	104
ITA	260	266	0	73	98
SVN	64	70	70	0	40
FRA	69	77	76	39	0

---

GUE

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

---

CAN	0	23	63	19
GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

---

GUE

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

---

CAN	0	23	63	19
GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

---

GUE

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

---

CAN	0	23	63	19
GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

---

GUE

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

---

CAN	0	23	63	19
GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

---

GUE

common bulls below diagonal

```
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN   0  23  63  19
GBR  20   0  76  11
USA  53  75   0  22
AUS  19   9  19   0
-----
```

GUE

```
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN   0  23  63  19
GBR  20   0  76  11
USA  53  75   0  22
AUS  19   9  19   0
-----
```

GUE

```
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN   0  23  63  19
GBR  20   0  76  11
USA  53  75   0  22
AUS  19   9  19   0
-----
```

GUE

```
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  USA  AUS
-----
CAN   0  36  19
USA  34   0   6
AUS  19   4   0
-----
```

GUE

```
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN   0  23  63  19
GBR  20   0  76  11
USA  53  75   0  22
AUS  19   9  19   0
-----
```

GUE

```
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN   0  23  63  19
GBR  20   0  76  11
USA  53  75   0  22
AUS  19   9  19   0
-----
```

GUE

```
common bulls below diagonal
common three quarter sib group above diagonal
  CAN  GBR  USA  AUS
-----
CAN   0  23  63  19
```

GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

-----  
GUE  
-----

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

CAN	0	23	63	19
GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

-----  
GUE  
-----

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

CAN	0	23	61	18
GBR	20	0	76	11
USA	52	75	0	22
AUS	18	9	19	0

-----  
GUE  
-----

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

CAN	0	23	63	19
GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

-----  
GUE  
-----

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

CAN	0	23	63	19
GBR	20	0	76	11
USA	53	75	0	22
AUS	19	9	19	0

-----  
GUE  
-----

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN AUS USA

CAN	0	19	63
AUS	19	0	22
USA	53	19	0

-----  
GUE  
-----

common bulls below diagonal  
common three quarter sib group above diagonal  
CAN GBR USA AUS

CAN	0	12	63	19
GBR	9	0	33	9
USA	53	31	0	21
AUS	19	8	18	0

GUE

common bulls below diagonal
common three quarter sib group above diagonal
CAN GBR USA AUS

Table with 4 columns (CAN, GBR, USA, AUS) and 4 rows of values.

GUE

common bulls below diagonal
common three quarter sib group above diagonal
CAN GBR USA AUS

Table with 4 columns (CAN, GBR, USA, AUS) and 4 rows of values.

GUE

GUE

HOL

common bulls below diagonal
common three quarter sib group above diagonal
AUS BEL CAN CHE DEU DFS ESP FRA GBR ITA NLD USA HUN POL NZL ZAF JPN CZE EST IRL KOR SVN PRT LVA

Large table with 24 columns and 24 rows of numerical data.

HOL

common bulls below diagonal
common three quarter sib group above diagonal
AUS BEL CAN CHE DEU DFS ESP FRA GBR ITA NLD USA HUN POL NZL ZAF JPN CZE EST IRL KOR SVN PRT LVA

Large table with 24 columns and 24 rows of numerical data.

ESP	489	598	837	468	824	707	0	1173	1108	1291	1080	1549	726	935	333	322	852	893	139	433	497	193	756	369
FRA	552	790	939	602	1127	844	940	0	1407	1548	1642	1988	815	1404	430	306	982	1186	159	522	495	214	796	402
GBR	742	731	1601	702	1204	925	909	999	0	1520	1581	2101	791	1135	482	338	885	1029	158	734	506	220	829	411
ITA	550	675	1522	657	1471	1005	963	998	1298	0	1514	2395	896	1340	327	330	976	1206	192	474	593	262	878	526
NLD	697	1067	1121	774	1771	1175	928	1117	1319	1275	0	1945	783	1312	582	319	828	1346	197	654	458	249	859	435
USA	888	653	3186	820	1504	1025	1021	1131	1921	1926	1490	0	1164	1587	543	397	1685	1553	207	574	841	236	1100	636
HUN	330	339	793	312	684	523	561	566	638	760	590	1053	0	742	275	271	603	838	116	335	427	146	574	310
POL	363	459	855	384	1098	733	609	872	855	1026	1003	1326	572	0	315	265	747	1097	185	407	494	236	768	471
NZL	397	216	319	204	304	295	270	274	377	269	519	456	205	193	0	168	316	332	47	336	182	69	285	114
ZAF	241	195	307	176	273	278	301	274	316	296	286	410	240	209	150	0	261	280	51	200	211	75	298	121
JPN	283	229	400	217	325	305	314	313	342	364	329	460	244	247	147	181	0	735	110	332	502	141	544	292
CZE	341	395	745	351	1067	613	618	767	728	898	1137	1165	711	757	216	212	227	0	147	402	480	217	699	404
EST	44	55	75	37	129	95	61	77	79	100	122	133	67	101	21	22	29	81	0	69	77	58	104	106
IRL	378	385	420	353	467	434	420	477	788	445	597	533	280	299	275	195	190	302	37	0	204	104	368	163
KOR	226	186	632	194	330	298	353	312	379	503	314	951	332	360	123	161	234	332	32	143	0	107	420	242
SVN	88	124	152	95	290	175	140	161	164	226	210	183	105	187	49	53	66	159	32	79	66	0	147	112
PRT	367	504	866	387	760	658	728	713	764	843	854	1118	551	709	220	290	257	574	65	320	354	115	0	346
LVA	97	124	267	108	482	223	186	201	229	357	271	541	210	320	58	74	85	253	54	90	145	62	273	0

HOL

common bulls below diagonal																								
common three quarter sib group above diagonal																								
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA	
AUS	0	491	885	453	852	758	630	862	887	668	863	1072	468	568	495	306	561	536	90	421	323	484	103	240
BEL	421	0	660	522	886	669	596	850	735	678	1006	769	416	580	280	247	426	532	93	402	267	501	128	238
CAN	801	625	0	821	2010	1158	1306	1462	1584	1761	1302	3180	898	1139	372	375	1156	1085	158	447	685	862	181	482
CHE	403	521	719	0	963	574	559	684	705	716	810	890	371	534	245	218	380	482	80	354	268	430	107	235
DEU	568	824	1185	813	0	2050	1430	2304	1819	2298	2500	2790	1023	1707	443	371	1167	1619	233	579	557	948	280	679
DFS	499	586	846	518	1174	0	959	1576	1340	1279	1597	1658	730	1130	458	383	801	1064	170	541	443	771	191	419
ESP	481	576	828	459	796	686	0	1236	1087	1279	1077	1532	717	918	324	367	847	877	137	419	492	741	159	385
FRA	589	836	994	627	1198	871	939	0	1550	1580	1868	2411	857	1492	513	390	1136	1240	164	568	530	831	185	433
GBR	742	731	1601	702	1204	925	881	1043	0	1520	1619	2102	791	1137	482	394	887	1029	158	735	507	830	185	439
ITA	550	675	1522	657	1471	1005	946	1009	1298	0	1525	2395	896	1340	327	340	978	1206	192	474	595	877	233	541
NLD	725	1104	1171	797	1798	1198	929	1239	1361	1286	0	2053	795	1327	595	372	866	1360	199	661	471	871	209	464
USA	888	654	3186	820	1504	1025	1005	1327	1921	1926	1692	0	1164	1589	543	466	1687	1553	207	575	843	1099	203	667
HUN	330	339	793	312	684	523	552	578	638	760	607	1053	0	743	275	299	603	838	116	335	429	574	128	327
POL	363	459	855	384	1098	733	589	917	856	1026	1013	1326	572	0	315	291	748	1097	186	407	495	767	210	492
NZL	397	216	319	204	304	295	263	298	377	269	538	456	205	193	0	205	316	332	47	336	182	284	58	132
ZAF	281	212	349	192	293	302	341	321	367	301	343	495	257	217	187	0	308	301	52	237	230	314	56	136
JPN	285	232	403	219	327	307	313	321	346	366	335	464	245	247	148	196	0	736	110	332	503	544	117	310
CZE	341	395	745	351	1067	613	598	798	728	898	1153	1165	711	757	216	224	228	0	147	402	481	700	188	419
EST	44	55	75	37	129	95	58	78	79	100	123	133	67	101	21	22	29	81	0	69	77	104	54	112
IRL	378	385	420	353	467	434	402	496	788	445	608	533	280	299	275	226	191	302	37	0	205	367	81	177
KOR	226	186	633	194	330	298	349	320	380	504	322	953	334	361	123	177	235	332	32	143	0	421	93	252
PRT	366	502	865	386	759	657	711	726	762	842	865	1117	550	708	219	300	259	574	65	319	355	0	120	363
SVN	71	97	135	80	261	149	113	140	138	199	179	160	91	167	42	40	51	139	28	65	59	95	0	101
LVA	107	135	281	118	504	237	192	214	247	367	292	562	223	332	68	82	89	261	59	100	147	285	59	0

HOL

common bulls below diagonal																							
common three quarter sib group above diagonal																							
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA	
AUS	0	477	885	437	849	758	642	733	884	668	472	1069	467	563	302	560	536	88	419	323	476	101	240
BEL	418	0	646	494	868	654	603	776	714	672	627	737	407	569	235	411	527	92	392	262	490	126	238
CAN	801	620	0	784	2007	1154	1315	1301	1582	1761	882	3180	898	1137	370	1154	1085	157	446	685	856	179	482
CHE	399	496	689	0	872	559	559	646	691	697	552	834	362	512	214	377	459	77	350	267	414	103	230
DEU	567	821	1185	754	0	2036	1458	2168	1815	2297	1623	2785	1019	1696	365	1163	1617	231	577	556	929	277	679
DFS	499	583	846	508	1170	0	983	1401	1328	1274	943	1648	726	1116	379	797	1062	168	539	444	755	188	418
ESP	492	600	838	465	841	716	0	1179	1110	1295	734	1554	727	938	369	855	896	140	434	498	753	162	392
FRA	551	789	939	594	1126	844	954	0	1404	1548	1005	1984	813	1402	342	982	1186	157	520	496	780	182	420
GBR	742	722	1601	692	1202	924	916	997	0	1520	947	2096	787	1126	388	884	1028	155	726	506	814	183	439
ITA	550	675	1522	644	1470	1004	971	997	1295	0	1139	2395	896	1337	335	976	1206	190	474	594	868	232	541
NLD	444	681	885	524	1392	870	652	848	900	1063	0	1090	501	967	206	458	940	159	377	321	554	198	359
USA	887	645	3186	767	1503	1024	1024	1129	1919	1925	979	0	1162	1585	460	1685	1552	206	571	841	1086	201	667
HUN	330	337	793	307	684	523	565	565	637	760	396	1052	0	740	296	603	838	116	332	428	567	127	327

POL	363	456	855	364	1098	730	618	872	851	1025	833	1325	572	0	286	747	1094	185	404	495	757	208	492
ZAF	278	209	346	188	290	299	340	297	364	297	185	490	255	214	0	304	296	49	234	227	308	53	134
JPN	283	229	400	217	325	305	314	313	342	364	256	460	244	247	192	0	735	110	331	502	540	116	310
CZE	341	395	745	339	1067	613	622	767	728	898	906	1165	711	757	220	227	0	145	401	481	692	186	419
EST	44	55	75	37	129	95	63	77	79	100	105	133	67	101	220	27	81	0	67	77	102	54	111
IRL	378	383	420	349	466	434	423	477	781	445	377	533	280	298	224	190	302	37	0	204	360	80	177
KOR	226	186	632	193	330	298	354	312	379	503	239	950	332	360	176	234	332	32	143	0	421	95	253
PRT	366	499	865	376	757	653	728	712	760	840	566	1115	549	701	297	256	574	64	319	354	0	120	360
SVN	70	97	134	79	259	148	118	139	137	199	178	160	91	167	37	51	139	28	65	59	95	0	100
LVA	107	135	281	116	504	237	207	211	247	367	233	562	223	332	81	89	261	59	100	147	285	59	0

HOL

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	491	885	453	852	759	620	862	887	668	889	1072	468	568	495	306	561	536	90	421	325	131	484	240
BEL	421	0	660	522	886	670	584	850	735	678	1030	769	416	580	280	247	426	532	93	402	268	161	501	238
CAN	801	625	0	821	2010	1158	1276	1462	1584	1761	1333	3180	898	1139	372	375	1156	1085	158	447	688	209	861	482
CHE	403	521	719	0	963	574	549	683	705	716	816	890	371	534	245	218	380	482	80	354	270	133	430	235
DEU	568	824	1185	813	0	2050	1390	2303	1819	2298	2513	2790	1023	1707	443	371	1167	1619	233	579	560	319	947	679
DFS	499	586	846	518	1174	0	942	1577	1341	1279	1639	1659	731	1131	459	383	801	1064	170	542	446	225	770	419
ESP	473	563	799	448	764	670	0	1214	1061	1245	1067	1496	708	903	318	367	841	859	134	412	491	186	736	378
FRA	589	836	994	626	1197	870	917	0	1550	1580	1983	2411	857	1492	513	390	1136	1240	164	568	533	218	830	433
GBR	742	731	1601	702	1204	925	858	1043	0	1520	1648	2103	791	1137	482	394	887	1029	158	737	509	221	830	439
ITA	550	675	1522	657	1471	1005	912	1009	1298	0	1529	2395	896	1340	327	340	978	1206	192	474	598	263	876	541
NLD	729	1128	1178	798	1800	1199	903	1261	1373	1287	0	2181	804	1336	608	382	900	1365	200	668	479	250	875	469
USA	888	654	3186	820	1504	1025	973	1327	1921	1926	1734	0	1164	1589	543	466	1687	1553	207	576	847	237	1098	667
HUN	330	339	793	312	684	523	548	578	638	760	607	1053	0	743	275	299	603	838	116	335	431	147	573	327
POL	363	459	855	384	1098	733	574	917	856	1026	1014	1326	572	0	315	291	748	1097	186	407	497	237	766	492
NZL	397	216	319	204	304	295	258	298	377	269	540	456	205	193	0	205	316	332	47	336	183	69	284	132
ZAF	281	212	349	192	293	302	340	321	367	301	345	495	257	217	187	0	308	301	52	237	231	76	314	136
JPN	287	233	404	220	328	308	311	323	348	367	338	466	245	248	148	196	0	736	110	332	505	142	543	310
CZE	341	395	745	351	1067	613	583	798	728	898	1154	1165	711	757	216	224	229	0	147	402	481	218	700	419
EST	44	55	75	37	129	95	57	78	79	100	123	133	67	101	21	22	29	81	0	69	77	58	104	112
IRL	378	385	420	353	467	434	395	496	790	445	611	533	280	299	275	226	191	302	37	0	206	105	367	177
KOR	226	186	633	194	330	298	343	320	380	504	325	957	334	361	123	178	236	332	32	143	0	109	422	252
SVN	89	125	153	96	291	176	132	163	165	227	213	184	106	188	49	53	67	160	32	80	67	0	148	118
PRT	366	502	865	386	759	657	703	726	762	841	867	1116	549	707	219	300	259	574	65	319	355	115	0	363
LVA	107	135	281	118	504	237	188	214	247	367	293	562	223	332	68	82	89	261	59	100	147	65	285	0

HOL

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	PRT	SVN	LVA
AUS	0	466	885	453	852	759	627	862	887	668	887	1072	468	568	495	306	366	536	90	421	322	484	103	240
BEL	418	0	640	515	864	649	573	803	704	672	941	722	401	568	265	235	316	518	93	387	258	493	128	237
CAN	801	615	0	821	2010	1158	1302	1462	1584	1761	1330	3180	898	1139	372	375	854	1085	158	447	684	861	182	482
CHE	403	517	719	0	963	574	557	684	705	716	816	890	371	534	245	218	317	482	80	354	267	430	107	235
DEU	568	818	1185	813	0	2050	1419	2304	1819	2298	2511	2790	1023	1707	443	371	928	1619	233	579	556	947	280	679
DFS	499	581	846	518	1174	0	953	1577	1341	1279	1631	1659	731	1131	459	383	573	1064	170	542	442	770	191	419
ESP	479	564	827	455	784	680	0	1227	1082	1272	1081	1525	716	912	321	367	664	872	135	417	491	738	159	382
FRA	589	823	994	627	1198	871	931	0	1550	1580	1972	2411	857	1492	513	390	792	1240	164	568	529	830	185	433
GBR	742	714	1601	702	1204	925	875	1043	0	1520	1645	2103	791	1137	482	394	646	1029	158	737	506	830	186	439
ITA	550	675	1522	657	1471	1005	939	1009	1298	0	1529	2395	896	1340	327	340	869	1206	192	474	594	876	234	541
NLD	729	1031	1178	798	1799	1199	922	1262	1372	1287	0	2174	804	1335	607	382	654	1365	199	667	473	875	209	468
USA	888	639	3186	820	1504	1025	1001	1327	1921	1926	1731	0	1164	1589	543	466	1166	1553	207	576	841	1098	204	667
HUN	330	335	793	312	684	523	551	578	638	760	607	1053	0	743	275	299	485	838	116	335	428	573	128	327
POL	363	456	855	384	1098	733	584	917	856	1026	1014	1326	572	0	315	291	644	1097	186	407	494	766	210	492
NZL	397	210	319	204	304	295	262	298	377	269	540	456	205	193	0	205	203	332	47	336	181	284	58	132
ZAF	280	209	348	191	292	301	339	320	366	300	344	494	256	216	187	0	210	301	52	237	229	314	56	136
JPN	246	204	363	200	299	277	270	285	298	344	294	406	217	237	124	151	0	593	98	244	418	429	114	270
CZE	341	392	745	351	1067	613	594	798	728	898	1154	1165	711	757	216	224	210	0	147	402	480	700	188	419
EST	44	55	75	37	129	95	57	78	79	100	123	133	67	101	21	22	29	81	0	69	77	104	54	112
IRL	378	379	420	353	467	434	400	496	790	445	611	533	280	299	275	225	167	302	37	0	204	367	81	177
KOR	226	186	633	194	330	298	349	320	380	504	325	953	334	361	123	177	220	332	32	143	0	420	94	251



PRT	366	499	865	386	759	657	707	726	762	841	867	1116	549	707	219	299	229	574	65	319	355	0	120	363
SVN	71	97	135	80	261	149	112	140	138	200	179	161	91	167	42	40	51	139	28	65	59	95	0	101
LVA	107	135	281	118	504	237	188	214	247	367	293	562	223	332	68	82	85	261	59	100	147	285	59	0

HOL

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	491	885	453	852	759	631	862	887	668	889	1072	468	568	495	306	560	536	90	421	323	131	485	240
BEL	421	0	660	522	886	670	596	850	735	678	1030	769	416	580	280	247	424	532	93	402	267	161	502	238
CAN	801	625	0	821	2010	1158	1306	1462	1584	1761	1333	3180	898	1139	372	375	1154	1085	158	447	684	209	863	482
CHE	403	521	719	0	963	574	559	683	705	716	816	890	371	534	245	218	379	482	80	354	268	133	431	235
DEU	568	824	1185	813	0	2050	1432	2303	1819	2298	2513	2790	1023	1707	443	371	1165	1619	233	579	556	319	949	679
DFS	499	586	846	518	1174	0	962	1577	1341	1279	1639	1659	731	1131	459	383	800	1064	170	542	443	225	772	419
ESP	482	577	828	460	799	688	0	1238	1089	1279	1093	1532	717	919	325	368	846	878	137	420	492	190	743	386
FRA	589	836	994	626	1197	871	942	0	1550	1580	1983	2411	857	1492	513	390	1134	1240	164	568	528	218	832	433
GBR	742	731	1601	702	1204	925	883	1043	0	1520	1648	2103	791	1137	482	394	885	1029	158	737	506	221	831	439
ITA	550	675	1522	657	1471	1005	947	1009	1298	0	1529	2395	896	1340	327	340	976	1206	192	474	593	263	878	541
NLD	729	1128	1178	798	1800	1199	933	1261	1373	1287	0	2181	804	1336	608	382	898	1365	200	668	473	250	877	469
USA	888	654	3186	820	1504	1026	1006	1327	1921	1926	1734	0	1164	1589	543	466	1685	1553	207	576	840	237	1100	667
HUN	330	339	793	312	684	523	553	578	638	760	607	1053	0	743	275	299	603	838	116	335	427	147	574	327
POL	363	459	855	384	1098	733	590	917	856	1026	1014	1326	572	0	315	291	748	1097	186	407	494	237	768	492
NZL	397	216	319	204	304	295	264	298	377	269	540	456	205	193	0	205	316	332	47	336	182	69	285	132
ZAF	281	212	349	192	293	302	342	321	367	301	345	495	257	217	187	0	307	301	52	237	230	76	314	136
JPN	283	229	400	217	325	305	310	317	342	364	332	460	244	247	147	193	0	735	110	332	502	142	544	310
CZE	341	395	745	351	1067	613	600	798	728	898	1154	1165	711	757	216	224	227	0	147	402	480	218	700	419
EST	44	55	75	37	129	95	58	78	79	100	123	133	67	101	21	22	29	81	0	69	77	58	104	112
IRL	378	385	420	353	467	434	403	496	790	445	611	533	280	299	275	226	190	302	37	0	204	105	368	177
KOR	226	186	632	194	330	298	348	318	379	503	323	950	332	360	123	177	234	332	32	143	0	108	419	252
SVN	89	125	153	96	291	176	136	163	165	227	213	184	106	188	49	53	67	160	32	80	67	0	148	118
PRT	367	505	866	388	760	659	716	729	766	844	871	1120	552	710	220	300	257	576	65	321	355	115	0	363
LVA	107	135	281	118	504	237	193	214	247	367	293	562	223	332	68	82	89	261	59	100	147	65	286	0

HOL

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	446	803	453	849	758	629	612	884	668	796	1071	466	529	258	522	420	89	406	239	128	482	218
BEL	412	0	611	504	837	620	564	695	674	665	883	691	391	536	207	381	441	90	364	213	157	485	217
CAN	748	604	0	798	1945	1062	1240	1160	1490	1751	1195	2986	876	1088	312	1032	951	155	417	581	205	846	454
CHE	403	507	704	0	962	573	562	626	705	716	788	890	369	516	198	372	415	80	347	222	129	428	216
DEU	568	800	1182	813	0	2048	1435	1970	1815	2298	2447	2787	1018	1668	335	1136	1414	232	561	483	315	946	652
DFS	499	572	843	518	1174	0	960	1199	1335	1279	1523	1657	726	1078	331	757	874	169	515	357	223	766	393
ESP	484	565	819	462	807	695	0	1046	1090	1285	1044	1534	719	892	323	813	774	136	410	415	190	748	367
FRA	490	706	868	565	1085	780	829	0	1199	1470	1450	1644	743	1330	272	832	1005	151	442	414	207	724	386
GBR	741	694	1528	701	1203	923	892	867	0	1520	1532	2095	788	1091	340	838	873	157	692	420	217	825	412
ITA	550	672	1521	657	1471	1005	952	968	1298	0	1513	2395	896	1325	332	970	1135	192	468	534	260	878	526
NLD	670	970	1101	769	1776	1170	898	1041	1295	1278	0	1850	766	1262	315	796	1194	197	605	387	246	850	435
USA	888	629	3073	820	1504	1025	1011	966	1920	1926	1457	0	1161	1537	400	1553	1344	207	548	708	233	1096	636
HUN	330	326	787	312	684	523	556	518	637	760	593	1053	0	716	272	588	722	116	321	371	144	573	310
POL	349	442	834	371	1081	710	569	857	833	1018	979	1296	554	0	252	712	993	184	370	446	233	747	472
ZAF	244	194	306	177	274	279	302	246	319	297	287	413	241	201	0	254	239	51	197	165	74	298	121
JPN	278	227	397	216	324	303	306	297	337	363	325	452	242	240	181	0	624	108	305	415	141	537	290
CZE	289	339	669	295	950	533	504	641	616	849	1042	1013	602	701	176	211	0	140	321	408	208	627	390
EST	44	54	75	37	129	95	58	74	79	100	122	133	67	100	22	29	76	0	67	72	58	104	106
IRL	376	370	417	350	465	432	406	409	756	443	581	527	278	286	196	189	247	37	0	150	103	354	159
KOR	166	162	543	168	293	255	285	281	304	453	267	797	283	337	119	200	286	30	109	0	98	361	226
SVN	87	121	151	94	288	175	136	156	163	224	209	182	104	186	53	66	155	32	79	63	0	146	112
PRT	364	495	846	385	760	656	720	670	762	845	850	1119	551	698	290	255	516	65	317	308	115	0	347
LVA	97	124	267	108	483	223	182	199	229	357	272	541	210	320	74	85	248	54	90	135	62	273	0

HOL

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	464	885	453	592	758	639	858	887	668	853	1072	467	567	306	560	536	90	420	322	103	490	240
BEL	418	0	638	514	689	645	590	796	702	671	934	721	401	567	235	402	518	93	386	259	128	498	236
CAN	801	615	0	821	1626	1158	1313	1446	1584	1761	1288	3180	897	1137	375	1154	1085	158	447	683	182	868	482
CHE	403	517	719	0	802	574	567	680	705	714	806	890	371	532	218	379	481	80	354	268	107	435	235
DEU	462	668	1063	671	0	1449	1177	1677	1369	2032	1908	2084	788	1434	250	852	1253	207	417	461	273	746	619
DFS	499	581	846	518	990	0	980	1549	1339	1278	1584	1657	729	1128	383	800	1064	170	541	443	191	778	419
ESP	489	590	837	468	654	707	0	1247	1108	1291	1093	1549	725	933	372	851	892	140	433	496	163	763	390
FRA	589	818	994	626	974	869	974	0	1535	1580	1814	2371	854	1482	389	1120	1235	162	562	523	185	837	432
GBR	742	714	1601	702	994	925	909	1043	0	1520	1603	2100	790	1133	393	884	1029	158	731	506	186	836	439
ITA	550	675	1522	656	1333	1005	963	1009	1298	0	1518	2395	896	1339	340	976	1206	192	474	592	234	879	541
NLD	720	1028	1165	796	1492	1196	953	1216	1352	1285	0	2010	788	1313	370	857	1355	199	654	467	209	874	463
USA	888	639	3186	820	1245	1025	1021	1292	1921	1926	1676	0	1163	1585	466	1684	1553	207	574	838	204	1106	667
HUN	330	335	793	312	534	522	561	578	638	760	605	1053	0	742	298	603	837	116	334	425	128	576	327
POL	363	456	855	383	983	732	607	917	855	1026	1006	1326	571	0	290	748	1094	184	405	492	209	771	491
ZAF	281	210	349	192	201	302	344	321	367	301	339	495	257	217	0	306	301	52	237	230	56	321	136
JPN	283	228	399	216	280	304	312	315	340	363	328	458	243	246	192	0	735	110	332	501	117	549	310
CZE	341	392	745	351	867	613	617	798	728	898	1152	1165	711	757	224	226	0	146	402	479	188	703	419
EST	44	55	75	37	115	95	61	78	79	100	123	133	67	100	22	29	81	0	69	77	54	103	112
IRL	378	379	420	353	359	434	420	496	784	445	607	533	280	299	226	190	302	37	0	204	81	369	177
KOR	225	186	631	194	291	298	350	316	379	502	319	943	331	359	177	232	331	32	143	0	93	422	251
SVN	71	97	135	80	261	149	117	140	138	200	179	161	91	167	40	51	139	28	65	58	0	120	101
PRT	369	505	871	391	632	663	735	733	772	846	871	1128	557	713	301	256	579	64	321	356	95	0	364
LVA	107	135	281	118	475	237	200	214	247	367	292	562	223	332	82	89	261	59	100	146	59	286	0

HOL

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	484	885	453	852	758	632	816	887	668	834	1072	468	567	495	306	560	536	90	421	323	128	485	240
BEL	420	0	656	521	882	665	601	830	729	676	977	754	413	577	276	245	417	530	93	400	267	158	502	238
CAN	801	625	0	821	2009	1158	1287	1390	1584	1761	1259	3180	898	1139	372	375	1154	1085	158	447	686	206	863	482
CHE	403	520	719	0	963	574	557	681	705	716	797	890	371	534	245	218	379	482	80	354	268	131	431	235
DEU	568	824	1185	813	0	2050	1423	2285	1819	2298	2472	2790	1023	1706	443	371	1165	1619	233	579	558	316	949	679
DFS	499	585	846	518	1174	0	969	1503	1340	1279	1560	1658	730	1130	458	383	800	1064	170	541	444	222	772	419
ESP	483	591	810	459	806	697	0	1213	1088	1264	1062	1521	718	924	331	372	849	878	138	427	494	188	753	386
FRA	588	832	989	625	1196	868	959	0	1500	1575	1781	2219	844	1482	485	377	1061	1229	162	554	516	215	825	428
GBR	742	731	1601	702	1204	925	893	1035	0	1520	1582	2102	791	1137	482	394	885	1029	158	735	507	218	831	439
ITA	550	675	1522	657	1471	1005	937	1008	1298	0	1514	2395	896	1340	327	340	976	1206	192	474	596	260	878	541
NLD	697	1067	1122	774	1771	1174	909	1193	1320	1275	0	1947	783	1314	582	363	828	1346	197	654	460	247	859	459
USA	888	653	3186	820	1504	1026	995	1257	1921	1926	1490	0	1164	1589	543	466	1685	1553	207	575	844	234	1100	667
HUN	330	339	793	312	684	523	557	576	638	760	590	1053	0	743	275	299	603	838	116	335	430	145	574	327
POL	363	459	855	384	1098	733	597	916	856	1026	1005	1326	572	0	315	291	748	1097	186	407	496	234	768	492
NZL	397	216	319	204	304	295	268	297	377	269	519	456	205	193	0	205	316	332	47	336	182	69	285	132
ZAF	281	212	349	192	293	302	344	320	367	301	325	495	257	217	187	0	307	301	52	237	230	75	314	136
JPN	283	229	400	217	325	305	310	317	342	364	329	460	244	247	147	193	0	735	110	332	502	140	544	310
CZE	341	395	745	351	1067	613	606	795	728	898	1137	1165	711	757	216	224	227	0	147	402	481	216	700	419
EST	44	55	75	37	129	95	60	78	79	100	122	133	67	101	21	22	29	81	0	69	77	58	104	112
IRL	378	385	420	353	467	434	414	492	788	445	596	533	280	299	275	226	190	302	37	0	205	103	368	177
KOR	226	186	633	194	330	298	348	320	380	504	315	953	334	361	123	177	234	332	32	143	0	107	421	252
SVN	87	124	151	95	289	175	137	162	163	225	210	182	105	187	49	53	66	159	32	79	66	0	147	116
PRT	367	504	866	387	760	658	724	725	764	843	854	1118	551	709	220	300	257	574	65	320	355	115	0	363
LVA	107	135	281	118	504	237	200	214	247	367	289	562	223	332	68	82	89	261	59	100	147	65	285	0

HOL

common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	484	885	453	852	712	632	858	887	668	863	1072	468	568	495	306	561	536	90	421	324	130	483	240
BEL	420	0	656	521	882	654	595	836	729	676	991	754	413	577	276	245	418	530	93	400	267	160	500	238
CAN	801	625	0	821	2010	1080	1307	1447	1584	1761	1302	3180	898	1139	372	375	1155	1085	158	447	687	208	860	482
CHE	403	520	719	0	963	570	561	683	705	716	810	890	371	534	245	218	379	482	80	354	269	132	430	235
DEU	568	824	1185	813	0	1996	1434	2299	1819	2298	2500	2790	1023	1707	443	371	1166	1619	233	579	559	318	946	679
DFS	499	585	846	518	1174	0	921	1466	1282	1273	1563	1565	714	1110	431	356	747	1030	168	524	432	224	761	415

ESP	482	578	829	461	800	689	0	1228	1091	1280	1080	1534	718	921	326	370	848	879	137	421	495	189	741	387
FRA	589	835	994	626	1196	870	944	0	1537	1580	1861	2372	855	1489	509	389	1122	1235	163	563	528	217	827	432
GBR	742	730	1600	702	1203	924	882	1041	0	1520	1619	2102	791	1137	482	394	886	1029	158	735	508	220	828	439
ITA	550	675	1522	657	1471	1004	948	1009	1297	0	1525	2395	896	1340	327	340	977	1206	192	474	597	262	876	541
NLD	725	1098	1171	797	1798	1198	932	1237	1360	1286	0	2053	795	1327	595	372	865	1360	199	661	473	249	870	464
USA	888	653	3186	820	1504	1025	1007	1292	1921	1926	1692	0	1164	1589	543	466	1686	1553	207	575	846	236	1097	667
HUN	330	339	793	312	684	523	554	578	638	760	607	1053	0	743	275	299	603	838	116	335	431	146	574	327
POL	363	459	855	384	1098	733	592	917	856	1026	1013	1326	572	0	315	291	748	1097	186	407	497	236	765	492
NZL	397	216	319	204	304	295	264	298	377	269	538	456	205	193	0	205	316	332	47	336	182	69	284	132
ZAF	281	212	349	192	293	302	343	321	367	301	343	495	257	217	187	0	308	301	52	237	230	75	313	136
JPN	283	230	401	217	326	306	312	318	343	365	332	461	244	247	147	194	0	736	110	332	504	141	544	310
CZE	341	395	745	351	1067	613	601	798	728	898	1153	1165	711	757	216	224	227	0	147	402	481	217	699	419
EST	44	55	75	37	129	95	58	78	79	100	123	133	67	101	21	22	29	81	0	69	77	58	103	112
IRL	378	385	420	353	467	434	404	496	788	445	608	533	280	299	275	226	190	302	37	0	205	104	367	177
KOR	226	186	633	194	330	298	350	320	380	504	322	954	334	361	123	178	235	332	32	143	0	108	422	252
SVN	88	124	152	95	290	175	135	162	164	226	212	183	105	187	49	53	66	159	32	79	66	0	147	117
PRT	366	502	865	386	759	654	713	726	762	842	865	1117	550	708	219	300	257	574	65	319	355	115	0	363
LVA	107	135	281	118	504	237	194	214	247	367	292	562	223	332	68	82	89	261	59	100	147	65	285	0

HOL

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	484	885	453	852	759	642	862	887	668	889	1072	468	568	495	306	560	536	90	421	323	131	485	240
BEL	420	0	656	521	882	666	610	839	729	676	999	754	413	577	276	245	417	530	93	400	267	161	502	238
CAN	801	625	0	821	2010	1158	1315	1462	1584	1761	1333	3180	898	1139	372	375	1154	1085	158	447	684	209	863	482
CHE	403	520	719	0	963	574	567	683	705	716	816	890	371	534	245	218	379	482	80	354	268	133	431	235
DEU	568	824	1185	813	0	2050	1459	2303	1819	2298	2513	2790	1023	1707	443	371	1165	1619	233	579	556	319	949	679
DFS	499	585	847	518	1174	0	986	1577	1341	1279	1639	1659	731	1131	459	383	800	1064	170	542	443	225	772	419
ESP	491	601	838	468	839	715	0	1266	1113	1295	1125	1554	728	942	335	372	855	896	141	435	497	194	760	392
FRA	589	835	994	626	1197	871	991	0	1550	1580	1983	2411	857	1492	513	390	1134	1240	164	568	528	218	832	433
GBR	742	731	1601	702	1204	925	916	1043	0	1520	1648	2103	791	1137	482	394	885	1029	158	737	506	221	831	439
ITA	550	675	1522	657	1471	1005	971	1009	1298	0	1529	2395	896	1340	327	340	976	1206	192	474	593	263	878	541
NLD	729	1105	1178	798	1800	1199	971	1261	1373	1287	0	2181	804	1336	608	382	898	1365	200	668	473	250	877	469
USA	888	653	3186	820	1504	1027	1024	1327	1921	1926	1734	0	1164	1589	543	466	1685	1553	207	576	839	237	1100	667
HUN	330	339	793	312	684	524	564	578	638	760	607	1053	0	743	275	299	603	838	116	335	427	147	574	327
POL	363	459	855	384	1098	733	617	917	856	1026	1014	1326	572	0	315	291	748	1097	186	407	494	237	768	492
NZL	397	216	319	204	304	295	271	298	377	269	540	456	205	193	0	205	316	332	47	336	182	69	285	132
ZAF	281	212	349	192	293	303	344	321	367	301	345	495	257	217	187	0	307	301	52	237	230	76	314	136
JPN	283	229	400	217	325	305	314	317	342	364	332	460	244	247	147	193	0	735	110	332	502	142	544	310
CZE	341	395	745	351	1067	613	620	798	728	898	1154	1165	711	757	216	224	227	0	147	402	480	218	700	419
EST	44	55	75	37	129	95	62	78	79	100	123	133	67	101	21	22	29	81	0	69	77	58	104	112
IRL	378	385	420	353	467	434	422	496	790	445	611	533	280	299	275	226	190	302	37	0	204	105	368	177
KOR	226	186	632	194	330	298	352	318	379	503	323	949	332	360	123	177	234	332	32	143	0	108	419	252
SVN	89	125	153	96	291	176	142	163	165	227	213	184	106	188	49	53	67	160	32	80	67	0	148	118
PRT	367	505	866	388	760	659	732	729	766	844	871	1120	552	710	220	300	257	576	65	321	355	115	0	363
LVA	107	135	281	118	504	237	207	214	247	367	293	562	223	332	68	82	89	261	59	100	147	65	286	0

HOL

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA
AUS	0	487	885	453	852	759	629	862	887	668	889	1072	468	568	306	561	536	90	420	323	131	484	240
BEL	419	0	656	520	880	665	593	843	729	677	1022	763	413	577	244	422	530	93	397	264	161	500	238
CAN	801	621	0	821	2010	1158	1305	1462	1584	1761	1333	3180	898	1139	375	1156	1085	158	447	685	209	861	482
CHE	403	519	719	0	963	574	558	683	705	716	816	890	371	534	218	380	482	80	354	268	133	430	235
DEU	568	823	1185	813	0	2050	1425	2303	1819	2298	2513	2790	1023	1707	371	1167	1619	233	579	557	319	947	679
DFS	499	585	847	518	1174	0	958	1577	1341	1279	1639	1659	731	1131	383	801	1064	170	542	443	225	770	419
ESP	480	572	827	457	791	684	0	1232	1087	1276	1090	1528	717	916	367	847	875	137	419	492	189	741	385
FRA	589	834	994	626	1197	871	934	0	1550	1580	1983	2411	857	1492	390	1136	1240	164	568	530	218	830	433
GBR	742	727	1601	702	1204	925	879	1043	0	1520	1648	2103	791	1137	394	887	1029	158	734	507	221	830	439
ITA	550	675	1522	657	1471	1005	943	1009	1298	0	1529	2395	896	1340	340	978	1206	192	474	595	263	876	541
NLD	729	1117	1178	798	1800	1199	928	1261	1373	1287	0	2181	804	1336	382	900	1365	200	668	475	250	875	469
USA	888	650	3186	820	1504	1027	1003	1327	1921	1926	1734	0	1164	1589	466	1687	1553	207	576	843	237	1098	667
HUN	330	338	793	312	684	524	552	578	638	760	607	1053	0	743	299	603	838	116	335	429	147	573	327

POL	363	459	855	384	1098	733	587	917	856	1026	1014	1326	572	0	291	748	1097	186	407	495	237	766	492
ZAF	281	212	349	192	293	303	340	321	367	301	345	495	257	217	0	308	301	52	237	230	76	314	136
JPN	288	233	405	221	329	309	315	324	349	368	338	467	245	248	196	0	736	110	332	503	142	543	310
CZE	341	395	745	351	1067	613	596	798	728	898	1154	1165	711	757	224	229	0	147	402	481	218	700	419
EST	44	55	75	37	129	95	58	78	79	100	123	133	67	101	22	29	81	0	69	77	58	104	112
IRL	378	384	420	353	467	434	401	496	787	445	611	533	280	299	226	191	302	37	0	205	105	367	177
KOR	226	186	633	194	330	298	349	320	380	504	325	954	334	361	178	236	332	32	143	0	108	421	252
SVN	89	125	153	96	291	176	134	163	165	227	213	184	106	188	53	67	160	32	80	67	0	148	118
PRT	366	501	865	386	759	657	710	726	762	841	867	1116	549	707	300	259	574	65	319	355	115	0	363
LVA	107	135	281	118	504	237	191	214	247	367	293	562	223	332	82	89	261	59	100	147	65	285	0

HOL

common bulls below diagonal																								
common three quarter sib group above diagonal																								
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	
AUS	0	484	885	453	852	759	632	862	887	668	889	1072	468	568	495	306	561	536	89	421	323	127	484	218
BEL	420	0	656	521	882	666	595	839	729	676	999	754	413	577	276	245	419	530	93	400	267	157	501	219
CAN	801	625	0	821	2010	1158	1306	1462	1584	1761	1333	3180	898	1139	372	375	1156	1085	158	447	686	204	861	456
CHE	403	520	719	0	963	574	560	683	705	716	816	890	371	534	245	218	380	482	80	354	268	129	430	216
DEU	568	824	1185	813	0	2050	1433	2303	1819	2299	2513	2790	1023	1707	443	371	1167	1619	232	579	558	314	947	651
DFS	499	585	847	518	1174	0	962	1577	1341	1279	1639	1659	731	1131	459	383	801	1064	169	542	444	221	770	393
ESP	482	578	828	460	799	688	0	1239	1090	1279	1094	1533	717	920	326	369	847	878	136	420	493	188	742	365
FRA	589	835	994	626	1197	871	943	0	1550	1580	1983	2411	857	1492	513	390	1136	1240	163	568	531	213	830	408
GBR	742	731	1601	702	1204	925	883	1043	0	1520	1648	2103	791	1137	482	394	887	1029	158	737	507	216	830	411
ITA	550	675	1522	657	1471	1005	947	1009	1298	0	1529	2395	896	1340	327	340	978	1206	192	474	596	260	876	526
NLD	729	1105	1178	798	1800	1199	933	1261	1373	1287	0	2181	804	1336	608	382	900	1365	199	668	477	245	875	436
USA	888	653	3186	820	1504	1026	1006	1327	1921	1926	1734	0	1164	1589	543	466	1687	1553	207	576	845	232	1098	636
HUN	330	339	793	312	684	524	553	578	638	760	607	1053	0	743	275	299	603	838	116	335	430	144	573	310
POL	363	459	855	384	1098	733	591	917	856	1026	1014	1326	572	0	315	291	748	1097	185	407	496	233	766	471
NZL	397	216	319	204	304	295	264	298	377	269	540	456	205	193	0	205	316	332	47	336	182	69	284	114
ZAF	281	212	349	192	293	303	342	321	367	301	345	495	257	217	187	0	308	301	52	237	230	75	314	123
JPN	285	232	403	219	327	307	313	321	346	366	336	464	245	247	148	196	0	736	110	332	503	140	543	292
CZE	341	395	745	351	1067	613	600	798	728	898	1154	1165	711	757	216	224	228	0	147	402	481	214	700	404
EST	44	55	75	37	129	95	58	78	79	100	123	133	67	101	21	22	29	81	0	69	77	57	104	106
IRL	378	385	420	353	467	434	403	496	790	445	611	533	280	299	226	191	302	37	0	205	103	367	163	
KOR	226	186	633	194	330	298	349	320	380	504	325	954	334	361	123	178	235	332	32	143	0	107	421	242
SVN	88	124	152	96	288	175	136	162	164	225	212	182	105	187	49	53	67	160	32	80	67	0	147	111
PRT	366	502	865	386	759	657	712	726	762	841	867	1116	549	707	219	300	259	574	65	319	355	115	0	346
LVA	97	124	267	108	482	223	180	203	229	357	272	541	210	320	58	74	85	253	54	90	145	62	273	0

HOL

common bulls below diagonal																								
common three quarter sib group above diagonal																								
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	ZAF	JPN	CZE	EST	IRL	KOR	SVN	PRT	LVA	NZL	
AUS	0	491	885	453	852	759	629	862	887	668	889	1072	456	568	306	553	536	90	420	325	127	484	240	47
BEL	421	0	660	522	886	670	596	850	735	678	1030	769	409	580	247	425	532	93	402	268	157	501	238	34
CAN	801	625	0	821	2010	1158	1306	1462	1584	1761	1333	3180	884	1139	375	1149	1085	158	447	688	204	861	482	55
CHE	403	521	719	0	963	574	559	683	705	716	816	890	367	534	218	380	482	80	354	270	129	430	235	40
DEU	568	824	1185	813	0	2050	1427	2303	1819	2299	2513	2790	1014	1707	371	1165	1619	233	579	560	314	947	679	57
DFS	499	586	847	518	1174	0	959	1577	1341	1280	1639	1659	717	1131	383	795	1064	170	542	446	221	770	419	42
ESP	480	575	828	458	793	685	0	1233	1087	1277	1091	1530	708	917	367	837	876	137	419	495	187	741	385	45
FRA	589	836	994	626	1197	871	935	0	1550	1580	1983	2411	839	1492	390	1123	1240	164	568	533	213	830	433	42
GBR	742	731	1601	702	1204	925	880	1043	0	1520	1648	2103	777	1137	394	882	1029	158	734	509	216	830	439	52
ITA	550	675	1522	657	1471	1006	945	1009	1298	0	1529	2395	895	1340	340	977	1206	192	474	598	260	876	541	50
NLD	729	1128	1178	798	1800	1199	930	1261	1373	1287	0	2181	787	1336	382	894	1365	200	668	479	245	875	469	68
USA	888	654	3186	820	1504	1027	1004	1327	1921	1926	1734	0	1135	1589	466	1667	1553	207	576	847	232	1098	667	55
HUN	318	330	779	308	677	515	538	567	622	757	594	1027	0	738	291	594	826	116	329	430	144	571	327	34
POL	363	459	855	384	1098	733	588	917	856	1026	1014	1326	568	0	291	746	1097	186	407	497	233	766	492	41
ZAF	281	212	349	192	293	303	340	321	367	301	345	495	246	217	0	305	301	52	237	231	75	314	136	18
JPN	285	232	403	219	327	307	313	321	346	366	336	464	239	247	196	0	735	109	330	505	140	543	310	38
CZE	341	395	745	351	1067	613	597	798	728	898	1154	1165	700	757	224	228	0	147	402	481	214	700	419	41
EST	44	55	75	37	129	95	58	78	79	100	123	133	67	101	22	29	81	0	69	77	57	104	112	14
IRL	378	385	420	353	467	434	402	496	787	445	611	533	272	299	226	191	302	37	0	206	103	367	177	34
KOR	226	186	633	194	330	298	349	320	380	504	325	957	332	361	178	235	332	32	143	0	108	422	252	35
SVN	88	124	152	96	288	175	134	162	164	225	212	182	105	187	53	67	160	32	80	67	0	147	115	21

PRT	366	502	865	386	759	657	711	726	762	841	867	1116	546	707	300	259	574	65	319	355	115	0	363	27
LVA	107	135	281	118	504	237	192	214	247	367	293	562	223	332	82	89	261	59	100	147	65	285	0	22
NZL	51	33	58	35	53	40	42	42	50	48	65	57	22	27	18	35	32	3	30	30	12	26	10	0

HOL

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common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	POL	NZL	JPN	CZE	EST	IRL	KOR	SVN	PRT	ZAF	HUN	LVA
AUS	0	477	884	436	847	634	634	860	751	667	735	792	465	488	365	419	89	354	205	127	401	165	313	240
BEL	419	0	648	495	870	610	597	822	648	674	885	650	492	271	317	446	93	340	186	157	429	144	301	238
CAN	800	620	0	784	2002	1001	1309	1461	1405	1759	1182	2767	1035	367	854	955	157	382	508	204	744	226	728	482
CHE	399	496	689	0	874	530	555	664	659	697	696	802	459	240	316	401	79	311	196	126	365	133	288	230
DEU	567	822	1184	757	0	1900	1436	2274	1657	2296	2363	2464	1570	433	927	1411	232	506	422	314	835	222	795	679
DFS	463	547	816	476	1127	0	860	1340	1096	1242	1419	1263	974	370	560	849	163	428	299	217	647	211	526	406
ESP	483	583	832	459	805	642	0	1247	982	1284	999	1364	825	327	667	773	136	352	365	189	648	218	558	388
FRA	589	829	994	611	1181	813	956	0	1260	1578	1573	1710	1324	504	792	1052	162	452	379	212	702	215	646	432
GBR	656	665	1445	646	1144	821	776	911	0	1478	1349	1729	991	374	631	847	146	543	358	214	688	220	577	422
ITA	550	675	1522	644	1470	981	952	1009	1272	0	1492	2293	1279	325	869	1135	191	443	464	260	798	241	780	541
NLD	638	962	1063	687	1734	1101	857	1113	1141	1266	0	1571	1176	484	645	1177	193	531	332	242	725	211	590	452
USA	718	614	2915	741	1422	926	902	1036	1700	1905	1288	0	1395	370	1127	1294	197	450	604	229	893	257	865	645
POL	308	395	797	320	1002	654	502	815	762	976	906	1205	0	237	622	961	173	323	398	223	665	188	600	466
NZL	394	214	317	201	303	264	266	297	309	269	442	328	149	0	201	242	46	271	112	68	216	101	155	131
JPN	246	204	363	200	299	276	272	285	298	344	294	406	224	124	0	566	97	227	348	128	407	164	430	270
CZE	289	339	669	286	949	529	504	655	609	849	1036	997	681	166	206	0	139	308	353	207	590	201	638	397
EST	44	55	75	37	129	92	58	78	76	100	119	130	92	21	29	76	0	62	68	57	96	44	104	112
IRL	332	346	379	316	435	373	352	417	560	424	515	458	247	232	167	245	37	0	124	101	295	125	225	169
KOR	153	142	478	150	260	220	246	250	260	395	232	692	304	82	179	245	29	92	0	96	297	127	306	204
SVN	88	124	152	95	288	173	137	162	162	225	211	182	177	49	63	156	32	80	62	0	141	66	135	115
PRT	307	425	722	321	671	546	593	607	618	768	710	909	622	167	216	485	60	260	258	109	0	205	425	340
ZAF	158	132	211	111	182	187	192	191	196	209	184	262	160	93	124	153	20	119	88	46	195	0	170	103
HUN	237	245	656	239	531	396	401	436	460	649	446	801	478	114	193	542	60	195	233	98	416	151	0	292
LVA	107	135	281	116	504	236	196	213	243	367	287	551	317	68	85	251	59	100	122	65	267	64	196	0

HOL

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common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	JPN	CZE	EST	IRL	KOR	SVN	PRT
AUS	0	491	885	453	851	759	629	739	887	668	889	1069	468	567	495	561	536	89	421	325	103	484
BEL	421	0	658	520	884	668	599	788	733	676	1028	764	416	579	280	425	532	93	401	268	127	500
CAN	801	625	0	821	2009	1158	1299	1306	1584	1761	1333	3162	898	1138	372	1156	1085	158	447	690	181	862
CHE	403	521	719	0	962	574	562	660	705	716	816	886	371	533	245	380	482	80	354	270	106	430
DEU	568	823	1185	813	0	2049	1436	2177	1818	2297	2512	2781	1022	1702	442	1166	1618	232	578	559	278	947
DFS	499	586	847	518	1174	0	963	1413	1341	1279	1639	1657	731	1128	459	801	1064	169	541	447	189	770
ESP	484	585	832	462	807	695	0	1166	1094	1285	1103	1531	722	927	331	845	884	136	426	498	160	750
FRA	559	794	949	611	1134	846	928	0	1413	1550	1692	1991	817	1407	432	988	1187	159	525	501	183	795
GBR	742	731	1601	702	1204	925	893	1010	0	1520	1648	2097	791	1136	482	887	1029	158	736	509	185	828
ITA	550	675	1522	657	1471	1005	952	1000	1298	0	1529	2390	896	1340	327	978	1206	192	474	599	233	877
NLD	729	1128	1178	798	1800	1199	944	1155	1373	1287	0	2175	804	1334	608	900	1365	199	668	479	207	876
USA	884	652	3159	815	1497	1024	1008	1147	1913	1918	1727	0	1161	1584	542	1683	1547	206	573	849	203	1096
HUN	330	339	793	312	684	524	556	570	638	760	607	1051	0	742	275	603	838	116	335	431	128	574
POL	363	459	855	384	1098	733	597	873	856	1026	1014	1322	572	0	315	747	1097	185	407	497	210	767
NZL	397	216	319	204	304	295	267	279	377	269	540	454	205	193	0	316	332	47	336	184	58	284
JPN	285	231	402	219	327	307	314	319	346	366	336	464	245	247	148	0	736	110	332	506	117	544
CZE	341	395	745	351	1067	613	606	771	728	898	1154	1159	711	757	216	229	0	147	402	481	186	699
EST	44	55	75	37	129	95	58	77	79	100	123	133	67	101	21	29	81	0	69	77	54	104
IRL	378	385	420	353	467	434	410	481	790	445	611	532	280	299	275	191	302	37	0	206	81	367
KOR	226	186	633	194	330	298	352	313	380	504	325	957	334	361	123	235	332	32	143	0	95	422
SVN	71	96	135	80	259	147	114	138	138	199	178	161	91	167	42	51	138	28	65	59	0	120
PRT	366	502	865	386	759	657	719	712	762	842	868	1110	550	708	219	258	574	65	319	355	95	0

HOL

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common bulls below diagonal

common three quarter sib group above diagonal

	AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	NZL	JPN	CZE	EST	IRL	SVN	PRT
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AUS	0	491	885	453	852	759	635	862	887	668	889	1072	468	568	495	561	536	89	408	102	485
BEL	421	0	660	522	886	670	603	850	735	678	1030	769	416	580	280	426	532	93	390	126	502
CAN	801	625	0	821	2010	1158	1310	1462	1584	1761	1333	3180	898	1139	372	1156	1085	158	433	180	863
CHE	403	521	719	0	963	574	563	683	705	716	816	890	371	534	245	380	482	80	347	107	431
DEU	568	824	1185	813	0	2050	1440	2303	1819	2298	2513	2790	1023	1707	443	1167	1619	232	563	278	949
DFS	499	586	847	518	1174	0	970	1577	1341	1279	1639	1659	731	1131	459	801	1064	169	518	189	772
ESP	484	585	832	462	807	695	0	1249	1100	1285	1106	1542	722	929	332	851	885	136	413	160	751
FRA	589	836	994	626	1197	871	956	0	1550	1580	1983	2411	857	1492	513	1136	1240	163	539	183	832
GBR	742	729	1600	702	1202	924	890	1041	0	1520	1648	2103	791	1137	482	887	1029	158	699	185	831
ITA	550	675	1522	657	1471	1005	952	1009	1296	0	1529	2395	896	1340	327	978	1206	192	468	233	878
NLD	729	1128	1178	798	1800	1199	944	1261	1371	1287	0	2181	804	1336	608	900	1365	199	632	207	877
USA	888	654	3186	820	1504	1027	1014	1327	1921	1926	1734	0	1164	1589	543	1687	1553	207	550	203	1100
HUN	330	339	793	312	684	524	556	578	638	760	607	1053	0	743	275	603	838	116	324	128	574
POL	363	459	855	384	1098	733	597	917	856	1026	1014	1326	572	0	315	748	1097	185	396	210	768
NZL	397	216	319	204	304	295	268	298	377	269	540	456	205	193	0	316	332	47	322	58	285
JPN	285	231	402	219	327	307	314	321	346	366	336	464	245	247	148	0	736	110	318	117	545
CZE	341	395	745	351	1067	613	606	798	727	898	1154	1165	711	757	216	229	0	147	387	187	700
EST	44	55	75	37	129	95	58	78	79	100	123	133	67	101	21	29	81	0	68	54	104
IRL	376	384	419	351	465	433	407	489	766	443	603	527	278	299	271	191	301	37	0	81	357
SVN	71	97	135	81	259	148	115	140	138	200	180	161	92	168	42	52	139	28	66	0	121
PRT	367	504	866	387	760	658	721	727	763	843	870	1118	551	709	220	259	574	65	320	95	0

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal															
AUS	BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	HUN	POL	JPN	CZE	EST	IRL	SVN	PRT		
AUS	0	483	885	453	851	759	637	735	887	668	869	1070	456	566	552	536	89	407	103	491	
BEL	420	0	653	517	878	663	601	782	726	674	982	747	405	574	412	529	93	387	127	505	
CAN	801	624	0	821	2009	1158	1312	1301	1584	1761	1302	3172	884	1138	1140	1085	158	433	181	873	
CHE	403	518	719	0	962	574	565	655	705	716	807	888	367	533	378	482	80	347	106	437	
DEU	568	823	1185	813	0	2049	1443	2171	1818	2297	2487	2789	1013	1701	1161	1618	232	562	278	958	
DFS	499	584	847	518	1174	0	974	1409	1341	1279	1611	1645	717	1128	790	1064	169	518	189	782	
ESP	485	592	834	465	813	700	0	1164	1102	1288	1092	1540	714	931	840	887	138	414	161	763	
FRA	552	790	939	602	1127	844	926	0	1408	1548	1666	1981	808	1405	976	1186	159	512	183	803	
GBR	742	728	1600	702	1202	924	896	997	0	1520	1623	2096	777	1136	875	1029	158	696	185	839	
ITA	550	675	1522	657	1471	1005	957	998	1296	0	1520	2393	895	1340	975	1206	192	468	233	883	
NLD	704	1070	1131	776	1773	1176	922	1121	1333	1276	0	2071	780	1323	862	1354	198	626	207	876	
USA	884	649	3186	820	1503	1027	1015	1131	1920	1926	1524	0	1135	1587	1634	1551	207	548	203	1112	
HUN	318	330	779	308	677	515	544	557	622	757	578	1027	0	737	593	826	116	319	128	578	
POL	363	458	855	384	1098	733	600	872	856	1026	1006	1326	568	0	745	1097	185	396	210	776	
JPN	283	230	401	217	326	306	314	314	343	365	331	461	238	247	0	733	109	314	117	550	
CZE	341	394	745	351	1067	613	609	767	727	898	1137	1164	700	757	227	0	147	387	186	705	
EST	44	55	75	37	129	95	60	77	79	100	122	133	67	101	29	81	0	68	54	105	
IRL	376	384	419	351	465	433	409	475	763	443	593	527	271	299	190	301	37	0	81	360	
SVN	71	96	135	80	259	147	115	138	138	199	178	161	91	167	51	138	28	65	0	120	
PRT	370	510	874	393	770	665	734	722	775	850	866	1130	556	715	258	580	65	322	95	0	

HOL

common bulls below diagonal

common	three	quarter	sib	group	above	diagonal													
BEL	CAN	CHE	DEU	DFS	ESP	FRA	GBR	ITA	NLD	USA	CZE	IRL	KOR	SVN	PRT	EST	HUN	POL	
BEL	0	608	429	714	616	540	737	670	571	827	689	433	362	173	106	418	64	299	344
CAN	604	0	709	1682	1062	1197	1269	1489	1574	1114	2984	936	417	451	152	731	112	727	717
CHE	430	613	0	760	483	472	575	603	609	622	745	377	286	178	87	343	58	280	314
DEU	684	1069	635	0	1594	1214	1764	1460	1801	1981	2227	1273	447	368	212	731	164	758	1014
DFS	568	844	430	1026	0	881	1404	1329	1016	1378	1638	857	515	270	154	643	119	531	670
ESP	538	766	369	667	650	0	1098	997	1098	949	1410	760	376	328	134	631	98	554	594
FRA	763	935	509	977	843	870	0	1405	1239	1447	1979	1018	511	337	147	684	110	644	916
GBR	692	1527	573	1013	922	790	998	0	1276	1356	2087	857	691	319	154	695	112	584	697
ITA	590	1397	558	1221	860	824	895	1126	0	1211	1987	975	382	405	186	695	141	722	840
NLD	900	1030	599	1510	1094	794	1038	1141	1096	0	1593	1142	545	299	168	700	140	582	787
USA	629	3072	662	1277	1026	879	1131	1918	1718	1259	0	1314	547	530	174	914	135	878	959
CZE	336	658	268	877	520	502	638	602	753	1008	987	0	311	304	158	571	98	634	685
IRL	370	416	277	375	433	367	475	757	377	523	527	239	0	113	66	294	45	227	234

KOR	134	437	139	241	204	228	231	237	353	216	615	212	86	0	79	260	47	272	289
SVN	83	117	66	200	124	99	114	121	164	146	140	119	54	53	0	106	40	109	155
PRT	417	718	301	620	543	579	598	611	677	686	910	468	258	228	82	0	64	420	465
EST	37	55	25	85	67	39	53	61	72	83	74	53	25	19	17	39	0	79	115
HUN	243	650	231	515	396	396	433	455	617	441	795	534	193	206	78	411	43	0	460
POL	266	545	216	623	444	356	530	529	642	567	744	447	189	202	126	424	53	365	0

HOL

common bulls below diagonal

common three quarter	sib	group	above diagonal																		
BEL	CHE	DEU	DFS	FRA	GBR	ITA	NLD	USA	CZE	JPN	IRL	KOR	CAN	PRT	ESP	SVN	EST	HUN	NZL	POL	
BEL	0	480	697	302	589	669	587	879	684	396	257	333	181	503	303	548	125	75	256	204	419
CHE	485	0	840	247	561	676	672	761	859	383	268	307	195	688	275	532	107	69	254	195	408
DEU	666	705	0	802	1573	1468	1945	2043	2242	1210	737	400	408	1535	589	1224	275	194	674	265	1322
DFS	241	201	368	0	497	626	531	788	686	437	220	276	133	322	263	417	85	61	225	194	420
FRA	594	502	950	262	0	994	1240	1196	1378	841	600	335	349	990	486	934	181	130	552	218	1073
GBR	689	664	1028	352	761	0	1365	1506	2052	789	522	628	358	1186	499	1030	186	132	516	341	880
ITA	599	609	1258	364	878	1180	0	1321	2148	1001	708	381	458	1523	573	1171	225	163	680	235	1107
NLD	958	744	1558	503	922	1264	1156	0	1805	1102	512	536	329	971	511	999	209	165	510	428	1023
USA	614	790	1293	343	868	1908	1795	1404	0	1218	931	502	604	2354	675	1465	204	162	791	340	1265
CZE	307	273	854	231	564	560	766	973	933	0	467	260	346	805	434	704	185	119	551	189	842
JPN	167	169	260	107	246	255	302	253	353	182	0	165	326	667	290	568	108	78	367	136	519
IRL	342	311	348	206	327	690	370	512	489	199	125	0	112	309	180	360	75	49	178	228	248
KOR	136	150	260	78	249	260	391	231	695	241	178	84	0	477	269	361	92	63	292	108	385
CAN	523	622	1065	247	792	1272	1385	980	2646	612	316	330	464	0	521	1010	179	124	627	212	880
PRT	301	238	502	194	449	439	552	484	700	356	173	160	232	525	0	463	114	77	332	142	519
ESP	554	433	666	274	750	842	866	855	959	456	235	363	245	707	411	0	161	114	500	231	716
SVN	94	80	261	58	139	138	196	179	161	138	50	59	59	135	88	114	0	51	123	56	202
EST	46	31	107	26	67	70	88	105	98	67	27	29	29	68	53	51	27	0	92	34	153
HUN	207	204	465	148	388	409	570	386	724	467	167	149	225	601	335	357	89	54	0	123	535
NZL	173	172	222	127	183	284	213	393	294	139	101	192	83	217	121	199	40	17	95	0	159
POL	338	292	898	254	710	697	871	808	1131	606	202	201	297	764	501	443	164	86	441	121	0

JER

common bulls below diagonal

common three quarter	sib	group	above diagonal							
AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE	
AUS	0	149	87	103	44	149	252	131	17	14
CAN	154	0	90	135	48	74	436	143	13	21
DFS	64	78	0	104	57	89	149	122	21	33
GBR	102	139	100	0	51	76	167	111	16	33
ITA	43	46	56	51	0	36	64	57	14	17
NZL	150	75	68	78	32	0	147	101	16	17
USA	245	436	117	173	68	154	0	251	33	34
ZAF	135	143	105	109	57	98	258	0	26	24
NLD	13	8	15	13	11	13	34	21	0	4
CHE	12	19	32	31	18	15	34	24	3	0

JER

common bulls below diagonal

common three quarter	sib	group	above diagonal							
AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE	
AUS	0	149	87	103	44	149	252	124	17	21
CAN	154	0	90	135	48	74	436	132	13	26
DFS	64	78	0	104	57	89	149	113	21	43
GBR	102	139	100	0	51	76	167	106	16	40
ITA	43	46	56	51	0	36	64	57	14	24
NZL	150	75	68	78	32	0	147	92	16	23
USA	245	436	117	173	68	154	0	231	33	41
ZAF	129	134	99	105	57	90	240	0	26	36
NLD	13	8	15	13	11	13	34	21	0	8
CHE	19	25	42	39	25	21	42	36	6	0

JER

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common bulls below diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	ZAF	NLD	USA	CHE
AUS	0	149	87	103	44	149	124	17	252	25
CAN	154	0	90	135	48	74	132	13	436	30
DFS	64	78	0	104	57	89	113	21	149	46
GBR	102	139	100	0	51	76	106	16	167	43
ITA	43	46	56	51	0	36	57	14	64	27
NZL	150	75	68	78	32	0	92	16	147	27
ZAF	129	134	99	105	57	90	0	26	231	40
NLD	13	8	15	13	11	13	21	0	33	10
USA	245	436	117	173	68	154	240	34	0	45
CHE	22	27	45	42	27	25	39	7	46	0

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JER

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common bulls below diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0	149	84	102	44	252	130	5	25
CAN	154	0	90	135	48	436	143	5	30
DFS	61	77	0	102	57	149	121	10	46
GBR	101	139	98	0	51	167	111	10	43
ITA	43	46	56	51	0	64	57	5	27
USA	245	436	116	173	68	0	250	16	45
ZAF	134	143	104	109	57	257	0	11	40
NLD	2	3	9	8	4	15	9	0	5
CHE	22	27	45	42	27	46	39	5	0

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JER

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common bulls below diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	149	87	103	44	149	252	131	17	25
CAN	154	0	90	135	48	74	436	143	13	30
DFS	64	78	0	104	57	89	149	122	21	46
GBR	102	139	100	0	51	76	167	111	16	43
ITA	43	46	56	51	0	36	64	57	14	27
NZL	150	75	68	78	32	0	147	101	16	27
USA	245	436	117	173	68	154	0	251	33	45
ZAF	135	143	105	109	57	98	258	0	26	40
NLD	13	8	15	13	11	13	34	21	0	10
CHE	22	27	45	42	27	25	46	39	7	0

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JER

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common bulls below diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	149	82	103	44	149	252	131	17	25
CAN	154	0	80	135	48	74	436	143	13	30
DFS	56	65	0	100	52	82	139	115	19	45
GBR	102	139	93	0	51	76	167	111	16	43
ITA	43	46	49	51	0	36	64	57	14	27
NZL	150	75	60	78	32	0	147	101	16	27
USA	245	436	105	173	68	154	0	251	33	45
ZAF	135	143	95	109	57	98	258	0	26	40
NLD	13	8	13	13	11	13	34	21	0	10
CHE	22	27	44	42	27	25	46	39	7	0

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JER

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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  USA  ZAF  NLD  CHE
-----
AUS   0  149   87  103   44  149  252  131   17   25
CAN  154   0   90  135   48   74  436  143   13   30
DFS   64   78   0  104   57   89  149  122   21   46
GBR  102  139  100   0   51   76  167  111   16   43
ITA   43   46   56   51   0   36   64   57   14   27
NZL  150   75   68   78   32   0  147  101   16   27
USA  245  436  117  173   68  154   0  251   33   45
ZAF  135  143  105  109   57   98  258   0   26   40
NLD   13   8   15   13   11   13   34   21   0   10
CHE   22   27   45   42   27   25   46   39   7   0
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JER
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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  ITA  ZAF  NLD  USA  CHE
-----
AUS   0  149   79   44  102   17  252   25
CAN  154   0   80   48  118   13  436   30
DFS   54   65   0   52   85   19  139   45
ITA   43   46   49   0   51   14   64   27
ZAF  104  114   71   49   0   23  196   40
NLD   13   8   13   11  16   0   33   10
USA  245  436  105   68  194   34   0   45
CHE   22   27   44   27  39   7   46   0
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JER
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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  USA  ZAF  NLD  CHE
-----
AUS   0  149   84  102   44  252  130   17   25
CAN  154   0   90  135   48  436  143   13   30
DFS   62   78   0  102   57  149  121   21   46
GBR  101  139   98   0   51  167  111   16   43
ITA   43   46   56   51   0   64   57   14   27
USA  245  436  117  173   68   0  250   33   45
ZAF  134  143  104  109   57  257   0   26   40
NLD   13   8   15   13   11   34   21   0   10
CHE   22   27   45   42   27   46   39   7   0
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JER
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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  USA  ZAF  NLD  CHE
-----
AUS   0  149   87  103   44  149  252  131   17   25
CAN  154   0   90  135   48   74  436  143   13   30
DFS   64   78   0  104   57   89  149  122   21   46
GBR  102  139  100   0   51   76  167  111   16   43
ITA   43   46   56   51   0   36   64   57   14   27
NZL  150   75   68   78   32   0  147  101   16   27
USA  245  436  117  173   68  154   0  251   33   45
ZAF  135  143  105  109   57   98  258   0   26   40
NLD   13   8   15   13   11   13   34   21   0   10
CHE   22   27   45   42   27   25   46   39   7   0
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JER
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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DFS  GBR  ITA  NZL  USA  ZAF  NLD  CHE
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AUS	0	149	79	103	44	149	252	131	17	25
CAN	154	0	74	135	48	74	436	143	13	30
DFS	54	63	0	91	52	75	132	110	19	45
GBR	102	139	89	0	51	76	167	111	16	43
ITA	43	46	49	51	0	36	64	57	14	27
NZL	150	75	55	78	32	0	147	101	16	27
USA	245	436	100	173	68	154	0	251	33	45
ZAF	135	143	93	109	57	98	258	0	26	40
NLD	13	8	13	13	11	13	34	21	0	10
CHE	22	27	44	42	27	25	46	39	7	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	149	87	103	44	149	252	131	17	25
CAN	154	0	90	135	48	74	436	143	13	30
DFS	64	78	0	104	57	89	149	122	21	46
GBR	102	139	100	0	51	76	167	111	16	43
ITA	43	46	56	51	0	36	64	57	14	27
NZL	150	75	68	78	32	0	147	101	16	27
USA	245	436	117	173	68	154	0	251	33	45
ZAF	135	143	105	109	57	98	258	0	26	40
NLD	13	8	15	13	11	13	34	21	0	10
CHE	22	27	45	42	27	25	46	39	7	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE
AUS	0	149	85	102	44	252	131	17	25
CAN	154	0	90	135	48	433	143	13	30
DFS	63	78	0	102	57	149	122	21	46
GBR	101	139	98	0	51	167	111	16	43
ITA	43	46	56	51	0	64	57	14	27
USA	245	434	117	173	68	0	250	33	45
ZAF	135	143	105	109	57	257	0	26	40
NLD	13	8	15	13	11	34	21	0	10
CHE	22	27	45	42	27	46	39	7	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	ZAF	NLD	CHE
AUS	0	149	87	103	44	149	252	131	17	25
CAN	154	0	90	135	48	74	436	143	13	30
DFS	64	78	0	104	57	89	149	122	21	46
GBR	102	139	100	0	51	76	167	111	16	43
ITA	43	46	56	51	0	36	64	57	14	27
NZL	150	75	68	78	32	0	147	101	16	27
USA	245	436	117	173	68	154	0	251	33	45
ZAF	135	143	105	109	57	98	258	0	26	40
NLD	13	8	15	13	11	13	34	21	0	10
CHE	22	27	45	42	27	25	46	39	7	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	ZAF	NLD	CHE	NZL
AUS	0	149	84	102	44	252	123	17	25	14
CAN	154	0	90	135	48	436	132	13	30	9

DFS	62	78	0	102	57	149	112	21	46	11
GBR	101	139	98	0	51	167	106	16	43	10
ITA	43	46	56	51	0	64	57	14	27	2
USA	245	436	117	173	68	0	231	33	45	12
ZAF	128	134	98	105	57	240	0	26	40	10
NLD	13	8	15	13	11	34	21	0	10	1
CHE	22	27	45	42	27	46	39	7	0	3
NZL	14	9	10	9	1	12	10	0	3	0

JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	NZL	ZAF	NLD	USA	CHE
AUS	0	149	71	149	121	17	252	25
CAN	154	0	69	74	129	13	436	30
DFS	49	60	0	68	97	19	125	45
NZL	150	75	50	0	88	16	147	27
ZAF	124	128	81	82	0	26	226	40
NLD	13	8	13	13	21	0	33	10
USA	245	436	95	154	227	34	0	45
CHE	22	27	44	25	39	7	46	0

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JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	NZL	USA	NLD	CHE
AUS	0	149	87	35	44	149	252	17	21
CAN	154	0	90	37	48	74	436	13	26
DFS	64	78	0	32	57	89	149	21	43
GBR	40	42	30	0	14	36	37	4	3
ITA	43	46	56	15	0	36	64	14	24
NZL	150	75	68	40	32	0	147	16	23
USA	245	436	117	40	68	154	0	33	41
NLD	13	8	15	5	11	13	34	0	8
CHE	19	25	42	4	25	21	42	6	0

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JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	NZL	USA	NLD	CHE
AUS	0	149	84	103	149	251	17	21
CAN	154	0	84	135	74	429	13	26
DFS	62	76	0	94	81	141	21	43
GBR	102	139	95	0	73	166	16	40
NZL	150	75	62	75	0	147	16	23
USA	244	430	110	172	154	0	32	41
NLD	13	8	15	13	13	33	0	8
CHE	19	25	42	39	21	42	6	0

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JER

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DFS	GBR	ITA	USA	NLD	CHE
AUS	0	124	74	83	40	212	15	19
CAN	129	0	90	135	48	432	13	26
DFS	53	78	0	102	57	148	21	43
GBR	81	139	98	0	51	166	16	40
ITA	38	46	56	51	0	64	14	24
USA	201	432	115	172	68	0	32	41
NLD	11	8	15	13	11	33	0	8
CHE	17	25	42	39	25	42	6	0

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JER
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JER
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RDC
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common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   23   9   43   9   13   21   13   8   3   15
CAN  23   0   10  142   68   4   32  146   3   0   10
DEU   9   10   0   50   4   11   8   3   12   0   29
DFS  32  143  41   0   52  82   54   79  33   0  120
GBR   8   67   4   48   0   0   25  53   1   0   3
NOR   9   4   10  61   0   0   6   0   22   0   11
NZL  20   30   8   52  22   5   0   20   2   2   6
USA  13  140   3   75  49   0   19   0   2   0   4
NLD   8   3   11  32   1   21   2   2   0   0  12
CAM   3   0   0   0   0   0   2   0   0   0   0
LVA  14  10  23  82   3   9   6   4  11   0   0
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RDC
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NZL  USA  NLD  CAM  NOR  LVA
-----
AUS   0   23   9   43   9   21   13   8   3   7   14
CAN  23   0   10  142   68  32  146   3   0   1   10
DEU   9   10   0   50   4   8   3   12   0   5   27
DFS  32  143  41   0   52  52  79   31   0  48  101
GBR   8   67   4   48   0   25  53   1   0   0   3
NZL  20   30   8   50  22   0   20   2   2   3   5
USA  13  140   3   75  49  19   0   2   0   0   4
NLD   8   3   11  30   1   2   2   0   0  12  11
CAM   3   0   0   0   0   2   0   0   0   0   0
NOR   6   1   4   34   0   3   0  11   0   0   1
LVA  13  10  21  67   3   5   4  10   0   0   0
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RDC
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  NOR  NZL  USA  NLD  CAM  LVA
-----
AUS   0   23   9   43   9   6   21   13   8   3   15
CAN  23   0   10  142   68   1   32  144   3   0   10
DEU   9   10   0   50   4   6   8   3   12   0   29
DFS  32  143  41   0   52  58  52   79  31   0  120
GBR   8   67   4   48   0   0   25  52   1   0   3
NOR   5   1   5  41   0   0   3   0  17   0   2
NZL  20   30   8   50  22   3   0   20   2   2   6
USA  13  139   3   75  48   0  19   0   2   0   4
NLD   8   3   11  30   1  16   2   2   0   0  12
CAM   3   0   0   0   0   0   2   0   0   0   0
LVA  14  10  23  82   3   1   6   4  11   0   0
-----

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RDC
-----
common bulls below diagonal
common three quarter sib group above diagonal
  AUS  CAN  DEU  DFS  GBR  USA  NZL  CAM  NOR  LVA
-----
AUS   0   23   9   43   9  13   8   3   7  15
CAN  23   0   10  142   68  146   3   0   3  10
DEU   9   10   0   50   4   3  12   0   5  29
DFS  32  143  41   0   52  79  30   0  56  120
-----

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GBR	8	67	4	48	0	53	1	0	0	3
USA	13	140	3	75	49	0	2	0	0	4
NLD	8	3	11	29	1	2	0	0	12	11
CAM	3	0	0	0	0	0	0	0	0	0
NOR	6	2	4	43	0	0	11	0	0	1
LVA	14	10	23	82	3	4	10	0	0	0

RDC

common bulls below diagonal

common three quarter	sib group	above diagonal									
AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA	
AUS	0	23	9	43	9	15	21	13	8	3	15
CAN	23	0	10	142	68	4	32	146	3	0	10
DEU	9	10	0	50	4	11	8	3	12	0	29
DFS	32	143	41	0	52	92	51	79	32	0	120
GBR	8	67	4	48	0	0	25	53	1	0	3
NOR	11	4	10	69	0	0	7	0	22	0	12
NZL	20	30	8	47	22	6	0	20	2	2	6
USA	13	140	3	75	49	0	19	0	2	0	4
NLD	8	3	11	31	1	21	2	2	0	0	12
CAM	3	0	0	0	0	0	2	0	0	0	0
LVA	14	10	23	82	3	10	6	4	11	0	0

RDC

common bulls below diagonal

common three quarter	sib group	above diagonal									
AUS	CAN	DEU	DFS	GBR	NZL	USA	NLD	CAM	NOR	LVA	
AUS	0	23	9	43	9	21	13	8	3	6	15
CAN	23	0	10	142	68	32	146	3	0	1	10
DEU	9	10	0	50	4	8	3	12	0	5	29
DFS	32	143	41	0	52	52	79	32	0	46	120
GBR	8	67	4	48	0	25	53	1	0	0	3
NZL	20	30	8	50	22	0	20	2	2	3	6
USA	13	140	3	75	49	19	0	2	0	0	4
NLD	8	3	11	31	1	2	2	0	0	12	12
CAM	3	0	0	0	0	2	0	0	0	0	0
NOR	5	1	4	32	0	3	0	11	0	0	1
LVA	14	10	23	82	3	6	4	11	0	0	0

RDC

common bulls below diagonal

common three quarter	sib group	above diagonal									
AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA	
AUS	0	23	9	43	9	15	21	13	8	3	15
CAN	23	0	10	142	68	4	32	146	3	0	10
DEU	9	10	0	50	4	11	8	3	12	0	29
DFS	32	143	41	0	52	95	54	79	33	0	120
GBR	8	67	4	48	0	0	25	53	1	0	3
NOR	11	4	10	71	0	0	7	0	22	0	12
NZL	20	30	8	52	22	6	0	20	2	2	6
USA	13	140	3	75	49	0	19	0	2	0	4
NLD	8	3	11	32	1	21	2	2	0	0	12
CAM	3	0	0	0	0	2	0	0	0	0	0
LVA	14	10	23	82	3	10	6	4	11	0	0

RDC

common bulls below diagonal

common three quarter	sib group	above diagonal								
AUS	CAN	DEU	DFS	NOR	NLD	USA	CAM	LVA		
AUS	0	23	9	43	15	8	13	3	14	
CAN	23	0	10	141	4	3	146	0	10	

DEU	9	10	0	50	11	12	3	0	27
DFS	32	142	41	0	92	30	79	0	101
NOR	11	4	10	69	0	22	0	0	10
NLD	8	3	11	29	21	0	2	0	11
USA	13	140	3	75	0	2	0	0	4
CAM	3	0	0	0	0	0	0	0	0
LVA	13	10	21	67	8	10	4	0	0

RDC

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common bulls below diagonal

common three quarter sib group above diagonal

AUS CAN DEU DFS GBR NOR USA NLD CAM LVA

AUS	0	23	6	43	9	15	13	8	3	15
CAN	23	0	8	142	68	4	146	3	0	10
DEU	6	8	0	41	4	10	3	12	0	16
DFS	32	143	35	0	52	92	79	31	0	120
GBR	8	67	4	48	0	0	53	1	0	3
NOR	11	4	9	69	0	0	0	22	0	12
USA	13	140	3	75	49	0	0	2	0	4
NLD	8	3	11	30	1	21	2	0	0	12
CAM	3	0	0	0	0	0	0	0	0	0
LVA	14	10	13	82	3	10	4	11	0	0

RDC

-----  
common bulls below diagonal

common three quarter sib group above diagonal

AUS CAN DEU DFS GBR NOR NZL USA NLD CAM LVA

AUS	0	23	9	43	9	15	21	13	8	3	15
CAN	23	0	10	142	68	4	32	146	3	0	10
DEU	9	10	0	50	4	11	8	3	12	0	29
DFS	32	143	41	0	52	95	54	79	31	0	120
GBR	8	67	4	48	0	0	25	53	1	0	3
NOR	11	4	10	71	0	0	7	0	22	0	12
NZL	20	30	8	52	22	6	0	20	2	2	6
USA	13	140	3	75	49	0	19	0	2	0	4
NLD	8	3	11	30	1	21	2	2	0	0	12
CAM	3	0	0	0	0	0	2	0	0	0	0
LVA	14	10	23	82	3	10	6	4	11	0	0

RDC

-----  
common bulls below diagonal

common three quarter sib group above diagonal

AUS CAN DEU DFS GBR NOR NZL USA NLD CAM LVA

AUS	0	23	9	43	9	15	21	13	8	3	15
CAN	23	0	10	142	68	4	32	146	3	0	10
DEU	9	10	0	50	4	11	8	3	12	0	29
DFS	32	143	41	0	52	92	52	79	31	0	114
GBR	8	67	4	48	0	0	25	53	1	0	3
NOR	11	4	10	69	0	0	7	0	22	0	12
NZL	20	30	8	49	22	6	0	20	2	2	6
USA	13	140	3	75	49	0	19	0	2	0	4
NLD	8	3	11	30	1	21	2	2	0	0	12
CAM	3	0	0	0	0	0	2	0	0	0	0
LVA	14	10	23	78	3	10	6	4	11	0	0

RDC

-----  
common bulls below diagonal

common three quarter sib group above diagonal

AUS CAN DEU DFS GBR NOR NZL USA NLD CAM LVA

AUS	0	23	9	43	9	15	21	13	8	3	15
CAN	23	0	10	142	68	4	32	146	3	0	10

DEU	9	10	0	50	4	12	8	3	12	0	29
DFS	32	143	41	0	52	87	54	79	33	0	120
GBR	8	67	4	48	0	0	25	53	1	0	3
NOR	11	4	11	66	0	0	7	0	22	0	12
NZL	20	30	8	52	22	6	0	20	2	2	6
USA	13	140	3	75	49	0	19	0	2	0	4
NLD	8	3	11	32	1	21	2	2	0	0	12
CAM	3	0	0	0	0	0	2	0	0	0	0
LVA	14	10	23	82	3	10	6	4	11	0	0

RDC

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA
AUS	0	23	9	43	9	15	13	8	3	15
CAN	23	0	10	142	68	4	143	3	0	10
DEU	9	10	0	50	4	11	3	12	0	29
DFS	32	143	41	0	52	95	79	33	0	120
GBR	8	67	4	48	0	0	53	1	0	3
NOR	11	4	10	71	0	0	0	22	0	12
USA	13	139	3	75	49	0	0	2	0	4
NLD	8	3	11	32	1	21	2	0	0	12
CAM	3	0	0	0	0	0	0	0	0	0
LVA	14	10	23	82	3	10	4	11	0	0

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RDC

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM	LVA
AUS	0	23	9	43	9	15	21	13	8	3	14
CAN	23	0	10	142	68	4	32	146	3	0	10
DEU	9	10	0	50	4	12	8	3	12	0	27
DFS	32	143	41	0	52	94	52	79	32	0	101
GBR	8	67	4	48	0	0	25	53	1	0	3
NOR	11	4	11	71	0	0	7	0	22	0	11
NZL	20	30	8	50	22	6	0	20	2	2	5
USA	13	140	3	75	49	0	19	0	2	0	4
NLD	8	3	11	31	1	21	2	2	0	0	11
CAM	3	0	0	0	0	0	2	0	0	0	0
LVA	13	10	21	67	3	9	5	4	10	0	0

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RDC

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM	LVA	NZL
AUS	0	23	9	43	9	15	13	8	3	15	2
CAN	23	0	10	142	68	4	144	3	0	10	1
DEU	9	10	0	50	4	11	3	12	0	29	1
DFS	32	143	41	0	52	89	79	33	0	120	4
GBR	8	67	4	48	0	0	52	1	0	3	2
NOR	11	4	10	66	0	0	0	22	0	12	1
USA	13	139	3	75	48	0	0	2	0	4	1
NLD	8	3	11	32	1	21	2	0	0	12	0
CAM	3	0	0	0	0	0	0	0	0	0	0
LVA	14	10	23	82	3	10	4	11	0	0	0
NZL	2	1	1	4	2	1	1	0	0	0	0

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RDC

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	NOR	NZL	NLD	USA	CAM	LVA
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AUS	0	23	9	38	15	21	8	13	3	15
CAN	23	0	10	136	4	32	3	146	0	10
DEU	9	10	0	47	12	8	12	3	0	29
DFS	29	136	41	0	86	47	30	74	0	103
NOR	11	4	11	66	0	7	22	0	0	12
NZL	20	30	8	46	6	0	1	20	2	6
NLD	8	3	11	29	21	1	0	2	0	11
USA	13	140	3	71	0	19	2	0	0	4
CAM	3	0	0	0	0	2	0	0	0	0
LVA	14	10	23	70	10	6	10	4	0	0

RDC

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0	23	9	43	8	17	21	13	8	3
CAN	23	0	10	142	65	6	32	146	3	0
DEU	9	10	0	50	4	13	8	3	12	0
DFS	32	143	41	0	52	110	54	79	33	0
GBR	7	64	4	48	0	0	22	51	1	0
NOR	13	5	12	87	0	0	8	0	23	0
NZL	20	30	8	52	19	7	0	20	2	2
USA	13	140	3	75	47	0	19	0	2	0
NLD	8	3	11	32	1	22	2	2	0	0
CAM	3	0	0	0	0	0	2	0	0	0

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	NZL	USA	NLD	CAM
AUS	0	23	9	43	8	15	21	13	8	3
CAN	23	0	10	142	65	4	32	143	3	0
DEU	9	10	0	50	4	11	8	3	12	0
DFS	32	143	41	0	52	95	54	79	33	0
GBR	7	64	4	48	0	0	22	51	1	0
NOR	11	4	10	71	0	0	7	0	22	0
NZL	20	30	8	52	19	6	0	20	2	2
USA	13	139	3	75	47	0	19	0	2	0
NLD	8	3	11	32	1	21	2	2	0	0
CAM	3	0	0	0	0	0	2	0	0	0

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common bulls below diagonal  
common three quarter sib group above diagonal

	AUS	CAN	DEU	DFS	GBR	NOR	USA	NLD	CAM
AUS	0	23	9	43	8	15	13	8	3
CAN	23	0	10	142	65	4	146	3	0
DEU	9	10	0	50	4	11	3	12	0
DFS	32	143	41	0	52	95	79	33	0
GBR	7	64	4	48	0	0	51	1	0
NOR	11	4	10	71	0	0	0	22	0
USA	13	140	3	75	47	0	0	2	0
NLD	8	3	11	32	1	21	2	0	0
CAM	3	0	0	0	0	0	0	0	0

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